SITE-WIDE
HEALTH AND SAFETY PLAN

YERINGTON MINE SITE

REVISION 1: DECEMBER 21, 2009

PREPARED FOR:

Atlantic Richfield Company
4 CENTERPOINT DRIVE
LA PALMA, CALIFORNIA 90623

PREPARED BY:

BROWN AND CALDWELL

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Approval Page

This Health and Safety Plan (HASP) has been prepared and reviewed by the following Brown and Caldwell (BC) personnel for use at: YERINGTON MINE SITE.

	Name	Signature	Title	Date
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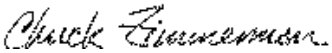
Reviewed By:	Chuck Zimmerman		Project Manager	12/21/2009
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The effective dates of this plan are not intended to cover a period greater than 12 months.

TABLE OF CONTENTS

SECTION **PAGE**

TABLE OF CONTENTS - CONTINUED

SECTION **PAGE**

TABLE OF CONTENTS - CONTINUED

SECTION **PAGE**

TABLE OF CONTENTS - CONTINUED

SECTION **PAGE**

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS & ABBREVIATIONS

AA	Area Authority
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
AHERA	Asbestos Hazardous Emergency Response Act
ALARA	As Low As Reasonably Achievable
APR	Air Purifying Respirator
ARC	Atlantic Richfield Company
BC	Brown and Caldwell
BLM	Bureau of Land Management
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CoW	Control of Work
CPR	Cardio Pulmonary Resuscitation
CRZ	Contaminant Reduction Zone
DAC	Derived Air Concentration
DAFW	Days Away From Work
DOE	Department of Energy
DOT	Department of Transportation
DPM	Disintegrations Per Minute
EPA	US Environmental Protection Agency
ESL	End of Service Life
EZ	Exclusion Zone
FID	Flame-Ionization Detector
FMS	Fluid Management System
GFCI	Ground Fault Circuit Interrupter
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HDPE	High-Density Polyethylene
HMIS	Hazardous Materials Information System
HSP	Health and Safety Program
HSSE	Health, Safety, Security and Environment
IA	Issuing Authority
ICRP	International Commission on Radiological Protection
IDLH	Immediately Dangerous to Life and Health
LEL	Lower Explosive Limit
LO/TO	Lockout/Tagout
MoC	Management of Change
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NDEP	Nevada Division of Environmental Protection
NFPA	National Fire protection Association
NIOSH	National Institute for Occupational Safety and Health
NORM	Naturally Occurring Radioative Material
NRR	Noise Reduction Rating
NVLAP	National Voluntary Laboratory Accreditation Program
O&M	Operations and Maintenance
Order	Administrative Order
OSHA	Occupational Safety and Health Administration
OSL	Optically Stimulated Luminescent Dosimeter
OU	Operable Unit
PA	Performing Authority
PACM	Potential Asbestos Containing Material
PAPR	Powered Air-Purifying Respirator
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PF	Protection Factor
PIC	Person In Charge
PID	Photo-Ionization Detector

PM	Project Manager
PO	Project Oversight
PPE	Personal Protective Equipment
PSM	Project Safety Manager
PWS	Pumpback Well System
RCA	Radiological Control Area
RCECP	Radiological and Chemical Exposure Control Plan
rem	Roentgen Equivalent Man
RI/FS	Remediation Investigation/Feasibility Study
RM	Remediation Management
RSUM	Regional Safety Unit Manager
SCBA	Self Contained Breathing Apparatus
SIMOP	Simultaneous Operation
SOP	Standard Operating Procedure
SSE	Short-Service Employee
SSO	Site Safety Officer
STEL	Short-Term Exposure Limit
SZ	Support Zone
TENORM	Technologically Enhanced Naturally Occurring Radioactive Material
TLD	Thermo-Luminescent Dosimeter
TLV	Threshold Limit Value
TSEA	Task Safety and Environmental Analysis
TWA	Time Weighted Average
UEL	Upper Explosive Limit
USA	Underground Service Alert
VLT	Vat Leach Tails
WRAT	Work Risk Assessment Tool

Table A1 PROJECT NOTIFICATION CALL-OUT LIST

If Emergency Services required:
Lyon County Sheriff Dispatcher
775-463-6620
or
Call 911
(from a land line if possible)

Name	Title/Responsibility	Office Phone	Cell Phone
Brown and Caldwell - Carson City			
1. Chuck Zimmerman	Project Manager	775-883-4118	775-233-5575
2. Penny Bassett	Project Safety Manager	775-883-4118	775-315-4343
3. Rich Mattucci	O&M Project Manager	775-883-4118	775-315-4697
4. Jim Bucha	Regional Safety Manager	916-853-5308	916-216-6374
Brown and Caldwell O&M - Yerington Mine			
1. Ron Hyatt	Site Safety Officer	775-463-9388	775-560-4217
2. Roe Souther	Site O&M	775-463-9388	775-315-7283
Atlantic Richfield (ARC)			
1. Jack Oman	Project Manager	714-228-6774	714-330-1706
2. John Batchelder	Secondary Project Manager	818-879-5861	818-652-8315
3. Ron Halsey	Operations Manager – US Mining	714-670-5331	714-746-4227
4. Ray Vose	West Region Safety Advisor	714-670-5359	818-398-4177
5. BP 24 Hour Notification Center		800-321-8642 or 312-856-2200	

Incident Notification Procedure:

1. **Assess the situation and determine if injury, first-aid, property damage, environmental spill or near-miss. All incident types require reporting.**

If Emergency Services are required, call the Lyon County Sheriff Dispatcher or 911 (from a land-line if possible) and get help on the way. Call BC O&M personnel if assistance is needed to open gates for responders.

   a. **Once immediate medical treatment is rendered, call BC Project Manager or Site Safety Manager as soon as possible and within at least one (1) hour. Notification must be verbal. Emails and voice mails are not acceptable.**
   b. **If possible, make arrangements to have another person travel with the injured person to the hospital.**

2. **If non-emergency, notify BC PM or Project Safety Manager within one (1) hour of incident. Notification must be verbal.**
   a. **Notification must be made prior to seeking non-emergency medical treatment.**
3. **The BC PM or Project Safety Manager shall make verbal notification to one of the listed Atlantic Richfield contacts within one (1) hour. Notification must be verbal. If verbal contact is not made with the first person, continue down the list until you speak directly with a person.**
4. **The BC Project Safety Manager, with the help of the affected employee, shall prepare an Incident Report and file the report in BP's Traction reporting system within 24 hours of the initial reporting.**

Table A2. LOCAL EMERGENCY AND NON-EMERGENCY CONTACTS

POLICE, FIRE, AND AMBULANCE		
Lyon County Sheriff Dept.	30 Nevin Way Yerington, NV 89447	775-463-6620 (Dispatch)
Yerington City Police Dept.		775-463-2333 (non-emergency) or 775-463-2332
Yerington-Mason Valley Fire District	30 Nevin Way Yerington, NV 89447	775-463-2261 (non-emergency)
Regional Emergency Medical Services Authority (REMSA)	450 Edison Way Reno, NV 89502	775-858-5700 (non-emergency)
HOSPITALS & MEDICAL CENTERS		
South Lyon Medical Center	Whitacre and Surprise Yerington, NV 89447	775-463-2301 (non-emergency)
Carson Tahoe Medical Center	1600 Medical Parkway, Carson City NV 89703	775-445-8000 (non-emergency)
UTILITIES		
Nevada Underground Service Alert (USA)	Dig notification	800-227-2600
Telephone- Nevada Bell and others	Repair/Service hotline	775-333-4611
Gas- Southwest Gas	Repair/Service hotline	775-882-2126
Gas- Paiute Pipeline	400 Eagle Station Ln. Yerington, NV 89447	775-882-0148
Electric- Sierra Pacific	Repair/Service hotline	800-962-4169
GOVERNMENTAL AGENCIES		
US EPA Region 9 - Nadia Hollan Burke	Region 9 San Francisco, CA	415-972-3187
US EPA Region 9 – David Seter	Region 9 San Francisco, CA	415-972-3250
Nevada Division of Environmental Protection – Joe Sawyer	Carson City, NV	775-687-9371
Bureau of Land Management – Tom Olsen	Nevada State Office Reno, NV	775-861-6400
BLM Law Enforcement	Carson City Field Office	775-885-6000
CHEMTREC		800-424-9300
National Response Center		800-424-8802

FIGURE A1
MAP OF ROUTE FROM MINE SITE TO HOSPITAL

South Lyon Medical Center

213 South Whitacre St.
Yerington, NV 89447
775-463-2301

Route

1. Depart the Mine Office or the Main Gate using the main entrance road (Burch Drive) heading east.
2. Turn right (south) on Hwy 95A/Hwy 339 and continue 1.1 mile to W. Bridge St., turn left.
3. Continue east on Bridge St. approximately 0.9 miles to Whitacre St., turn left.
4. Continue two blocks to Hospital at corner of Whitacre and Surprise St.
5. Enter the Urgent Care door.

FIGURE A2
EMERGENCY EVACUATION MEETING LOCATION

The emergency evacuation meeting location is inside the main gate on the north side of Burch Drive.

1. Assemble at the meeting location if a site evacuation is requested by any worker at the site.
2. Wait here until all workers on the site are evacuated and accounted for and further instructions are given.
3. At least one person shall remain here to guide emergency response personnel if required.

SECTION 1.0
GENERAL INFORMATION

The health and safety requirements for Atlantic Richfield Company ("ARC") and all contractors and sub-contractors working at the Yerington Mine Site ("Site") under the requirements of the Administrative Order ("Order") for Remedial Investigation and Feasibility Study ("RI/FS"), Docket No. 9-2007-0005, are presented in this Site-Wide Health and Safety Plan ("HASP"). The purpose of this HASP is to ensure the protection of on-Site workers and the public during the performance of work required under the Order. Primary activities at the Site may include operations and maintenance ("O&M") activities, collection of samples from air, ground water, surface water, and solid materials (e.g., soil), installation of monitoring equipment, earth moving and grading, and structure demolition. Because of the anticipated length of time involved with investigation and closure operations, revisions of this HASP are expected to occur periodically throughout the project (at a minimum the HASP should be reviewed annually). These revisions would be included as written addenda to this HASP, or re-issuance of the HASP as a revised version, with appropriate revision date.

1.1 Introduction

This HASP provides Site and task-specific information unique to activities at the Site. The HASP identifies the potential physical and chemical hazards that may be encountered, and specifies the health and safety control measures to be followed throughout the course of the operations. The HASP also identifies the supervisory personnel and their responsibilities, training and medical surveillance requirements, personal protective equipment ("PPE"), Site control, decontamination protocols, and emergency response procedures.

Regulatory Authority. Unless noted otherwise, health and safety regulatory guidance for activities conducted at the Site shall conform to standards set by the Occupational Safety and Health Administration ("OSHA") under 29 Code of Federal Regulation ("CFR") Part 1910 (General Industry) or Part 1926 (Construction Safety). This Plan has also been prepared in accordance with the U.S. Environmental Protection Agency's ("EPA") Standard Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992) which provides guidance for implementing health and safety activities at EPA managed Superfund Sites. Since this mine Site is no longer active, the Mine Safety and Health Administration ("MSHA") no longer has regulatory authority over safety activities at the Site.

Availability of HASP. Updated copies of this HASP must be made available to all Site workers and shall be kept on-Site in the BC field office at all times during the project. Contractors shall ensure that all employees working at the Site read and sign an acknowledgement form prior to entering the Site for work related activities.

Brown and Caldwell Health and Safety Program. Detailed procedures for implementation of safe work practices are included in the Brown and Caldwell Health and Safety Manual and should be referenced as needed where details are not available in this HASP. Health, Safety, Security and Environment ("HSSE") Defined Practices (e.g. ground disturbance defined practice, control of work defined practice, simultaneous operations defined practice, etc.) are contained in the BC HSP and shall be readily available for Site workers. The table in Appendix A is a linkage document that incorporates relevant portions of the BC HSP into this HASP.

1.2 Site History

The Yerington Mine Site is located approximately one mile west of the town of Yerington in Lyon County, Nevada (Figure 1-1). Anaconda operated the mine from 1953 to 1978 for the recovery of copper from oxide and sulfide ores extracted from the open-pit mine in the southern portion of the Site. The mine was purchased by Atlantic Richfield Company in 1978 and shut down shortly thereafter due to low metal prices and difficult mining conditions.

In 1989, Arimetco International purchased the Site and 're-mined' the oxide tailings as well as a new ore body located north of the Site. Arimetco expanded leaching operations in the southern, central and western portions of the Site, which included the construction and operation of an electrowinning plant located near the mill area. Leach pads and solution ponds were also constructed in several locations throughout the Site.

The RI/FS Administrative Order has subdivided the Site into eight operable units ("OU") based on historical activities that occurred within each area (Figure 1-2):

- Site-Wide Groundwater (OU-1)
- Pit Lake (OU-2)
- Process Areas (OU-3)
- Evaporation Ponds and Sulfide Tailings (OU-4)
- Waste Rock Areas (OU-5)
- Oxide Tailings Areas (OU-6)
- Wabuska Drain (OU-7)
- Arimetco Facilities (OU-8)

1.3 Site Description

The Site consists of a total of approximately 3,600 acres of land within the fenced property boundary, consisting of both privately owned (patented) land as well as land managed by the U.S. Bureau of Land Management ("BLM"). A majority of this land has been disturbed by mining, processing or waste disposal activities which can be subdivided into the following areas:

- Mine Pit (OU-2) – Mining at the Site took place in one large open pit which was mined to a depth of approximately 810 feet. Since mining operation ceased the pit has been filling in with water which currently has a depth of approximately 450 feet and is referred to as the Pit Lake. Hazards in the pit can include unstable highwalls, falling rock, steep unprotected pit walls, and drowning.
- Waste Rock Areas (OU-5) – Waste rock from the mining operation was stockpiled primarily in an area located directly south of the Mine Pit. Waste rock typically consists of un-mineralized or weakly mineralized rock and alluvial gravel soils. Hazards consist of uneven ground surfaces and unprotected steep slopes.
- Process Areas (OU-3) – The main Process Area is located north of Burch Drive in the center of the property and consists of approximately 20 buildings, a number of tanks that were used for copper recovery, and remnant concrete foundations from demolished buildings and processing facilities. The area also contains above- and below-ground pipes, utilities, and trenches. Most of the remaining buildings and equipment are in poor condition and are generally unsafe for occupation or use. Unprotected foundations and basements and general debris and uneven surfaces have created tripping and falling hazards.
- Oxide Tailings (OU-6) – Oxide tailings consist of the remnant ore after oxide copper was leached from the rock. The material is stockpiled in 100 foot tall piles directly north of the Process Area. There are no buildings or process equipment in these areas but secondary mining operations have created steep unprotected embankments that can be a hazard when driving or walking near the edge.
- Sulfide Tailings (OU-4) – The sulfide tailings area consists of a large flat feature that was used as a slurry storage pond for the waste solids from the sulfide process plant. The waste in this area is a very fine clay-like material that has subsequently been capped in most areas with a crushed gravel. The area is dry and solid and safe to walk and drive on, but uneven surfaces and embankments can create a driving hazard. A dust hazard exists on windy days which can reduce visibility and create an inhalation hazard.
- Evaporation Ponds (OU-4) – The evaporation ponds are located at the far north end of the property and consist of several pond areas, some that still contain standing water or saturated solids that are unsafe to walk on. The solutions in these ponds can have an acidic pH and contact should be avoided.
- Heap Leach Pads (OU-8) – Five heap leach pads were constructed by Arimetco in the 1980s for the purpose of leaching ore with a weak sulfuric acid solution. The solutions were captured by a liner underneath the pads and directed to nearby process solution ponds. These acidic leach solutions are still draining from several of these pads and ponds. The pH of the leach solutions is typically 2 to 5 pH and contact should be avoided.

- Arimetco Plant (OU-8) – Arimetco constructed a solvent extraction and electrowinning plant located on the south side of Burch Drive. All chemicals have been removed from these areas but the buildings are in disrepair and potentially hazardous.
- Asbestos Materials – Asbestos is known to exist in the transite pipe that occurs throughout the Site but is primarily in the Process Area and Waste Rock areas. Asbestos is also suspected in the building construction materials (e.g. flooring, roofing, siding) of the old Anaconda Administration Building and possibly other buildings in the Process Area.

1.4 Site Activities

On-going operations and maintenance ("O&M") and Site investigation activities, as required by the RI/FS Order, are being conducted by ARC contractors. A summary of these Site activities include, but are not limited to:

O&M Activities:

- Pumpback Well System ("PWS") Maintenance - Maintenance of wells, pumps, drainage lines and PWS evaporation ponds.
- Fluid Management System ("FMS") Maintenance - Maintenance and routine operations on Arimetco heap leach fluid systems including leach pads, drainage ditches and pipelines, fluid collection ponds and pumps; responsibilities do not include system enhancements or emergency repair.
- Site Security - Control of access onto the mine; inspection and maintenance of the mine perimeter fence.
- Wildlife Mitigation - Maintenance of stationary wildlife aversion devices (bird call towers, propane cannons); employment of avian hazing techniques (pyrotechnics, air-soft rifle, radio-control boat); observations and reporting of wildlife visits to the Site and wildlife mortalities.
- Road Maintenance - Supervision of semi-annual road maintenance/grading.

Remedial Investigation Activities:

- Groundwater Investigations and Monitoring - Drilling and installation of permanent or temporary monitor wells; quarterly sampling of designated monitor wells and domestic wells; sampling of various surface water bodies (e.g. ditches and rivers).
- Soil and Sediment Sampling - Drilling for collection of samples at depth; hand auger/core for collection of shallow soil or pond sediment.
- Pit Lake Investigation and Monitoring - Collection of water samples at surface and depth in the lake; collection of water samples from seeps contributing to the lake water; collection of submerged sediment samples.

- Air and Weather Monitoring - Collection of air particulate samples from stationary or temporary sampling locations; collection of continuous local weather data from a stationary monitoring station.
- Radiation Survey - Implementation of radiological surveys within various mine units.
- Asbestos Survey - Evaluation of potential asbestos containing materials.

Site Closure Activities:

- Waste Remediation - May include capping in place, consolidation to an on-Site landfill location, or excavation for removal to an off-Site landfill.
- Building Demolition - Removal of buildings, tanks, concrete foundations, scrap materials; includes potential asbestos removal and disposal.

1.5 Roles and Responsibilities

The following primary companies and agencies will be involved with investigation and closure activities at the Yerington Site:

- Atlantic Richfield Company ("ARC")
- Brown and Caldwell ("BC") – Primary contractor to ARC
- U.S. Environmental Protection Agency ("EPA") – Managing governmental agency
- Nevada Division of Environmental Protection ("NDEP") – Consulting governmental agency
- Bureau of Land Management ("BLM") – Consulting governmental agency

Additional companies may become involved at the Site as subcontractors to those listed above or as additional responsible parties named in enforcement actions.

Roles and responsibilities are defined for only Atlantic Richfield and their primary contractors. Names and contact numbers for the individuals filling the specific roles defined below are provided in Table A1 at the front of this document where it can be easily located and used.

Atlantic Richfield / Remediation Management ("RM")

Project Manager ("ARC PM") – The ARC PM is responsible for communicating the ARC Health, Safety Security, and Environment ("HSSE") expectations to all primary contractors and providing the information resources and tools necessary to comply with those expectations. The PM is the primary point of contact for all contractors regarding project and health and safety issues and the first person in the incident reporting chain-of-command. The ARC PM may choose to utilize the assistance of a Project Oversight ("PO") or secondary project manager to act on his behalf in management of the project including Site field activities.

Regional Safety Advisor – The ARC Regional Safety Advisor serves as a secondary backup in the Site incident reporting chain-of-command. He also provides information on other safety incidents within ARC as a lessons-learned for educating all contractors on potential risks.

Primary Contractors

Project Manager - The PM is responsible for ensuring that investigation activities are completed according to the requirements of the Order and that those activities are completed in a safe manner that does not put field personnel, the public or the environment at risk. The PM is also responsible for the following:

- Informing project participants of safety and health requirements at the Site;
- Communicating HSSE issues to the ARC PM; and
- Providing the resources necessary for maintaining a safe and healthy work environment for employees.

Project Safety Manager ("PSM") - The PSM has overall responsibility for implementation of the HSSE requirements specified in the BC Health and Safety Manual, the Site HASP, and regulatory safety requirements specified by OSHA. The PSM is also responsible for the following:

- Informing project participants of safety and health hazards identified at the Site;
- Providing a copy of this HASP to project participants and a copy to each subcontractor prior to the start of field activities;
- Ensuring that the project team is adequately trained and that safety briefings are performed in accordance with this HASP;
- Monitoring the safety performance and documenting field team compliance with this HASP by performing periodic inspections to evaluate safety practices at the Site; and
- Reporting any injury or near-miss incident to the contractor PM and the ARC PM as soon as possible according to the incident reporting procedures.

Site Safety Officer ("SSO") – An SSO will be assigned for each project and has on-Site responsibility for implementation of HSSE requirements for that project. The SSO has the authority to monitor and correct health and safety issues as identified. The SSO is responsible for the following:

- Reporting unsafe conditions or work practices at the Site to the PM and PSM;
- Stopping operations that threaten the health and safety of the field team or members of the surrounding community;
- Performing air monitoring, as necessary, as prescribed in this HASP;

- Conducting daily toolbox safety meetings and assuring that project personnel understand the requirements of this HASP;
- Limiting access to work areas on the Site to field team members and authorized personnel; and
- Reporting any injury or near-miss incident to the PM and PSM as soon as possible according to the incident reporting procedures.

Field Personnel – Field personnel are responsible for familiarizing themselves with health and safety aspects of the project and for conducting their activities in a safe manner. This includes attending Site briefings, communicating health and safety observations and concerns to the SSO, maintaining current medical and training status and maintaining and using proper tools, equipment and PPE. Responsibilities of all field personnel include, but are not limited to, the following:

- Follow the provisions of this HASP, company health and safety procedures and regulatory requirements;
- Stop operations that threaten the health and safety of the field team or members of the surrounding community and immediately notify the SSO or PSM of the recognized hazard;
- Participate in pre-job hazard assessments to identify all hazards and appropriate mitigation;
- Inspect PPE before use, using only intact protective clothing and related gear, and changing suits, gloves, etc. if they are damaged or beyond their useful service life;
- Set up, assemble, and check out all equipment and tools for integrity and proper function before starting work activities;
- Do not use faulty or suspect equipment;
- Be alert regarding the safety of all people in the vicinity;
- Practice contamination avoidance whenever possible and perform decontamination procedures as specified in this HASP; and
- Notify the SSO or PSM immediately if there is an incident that causes or could have caused an injury, illness or property loss.

Subcontractors

This HASP has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of Atlantic Richfield's employees and contractors at the Site. A copy of this HASP shall be provided to subcontractors in an effort to help them identify expected conditions at the Site and general Site hazards. The subcontractor shall remain responsible for identifying and evaluating hazards at the Site as they pertain to their activities and for taking appropriate precautions. For example, this HASP may not address specific hazards associated with tasks and equipment that are particular to the subcontractor's

scope of work and Site activities (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on this HASP to identify all hazards that may be present at the Site as a result of their activities.

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors shall operate equipment in accordance with their standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the Site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the Site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own HASP for this project or other health and safety program documents for review.

Subcontractor personnel are expected to comply fully with the requirements of this HASP and referenced safety procedures and practices as well as their company's HASP. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job Site.

HSSE Roles & Responsibilities

There are several HSSE roles that may be fulfilled by ARC personnel, the primary contractor or by subcontractors, depending on the job and the nature of the work.

Issuing Authority ("IA") – The IA is responsible for the issuance and closure of permits in his or her area of competency (e.g., hot work, confined space entry, ground disturbance, lifting and energy isolation work permits). The IA shall monitor the work being done under the permit to ensure required HSSE controls are in place and the actual work is limited to the scope of work defined in the permit. The IA has the authority to stop work if the requirements of the permit are not being met and shall sign reauthorization of a permit to continue work if the work has been stopped.

Performing Authority ("PA") – The PA is the person(s) or subcontractor who will be implementing a permitted work task. The PA is responsible for activities carried out on RM premises under the *Control of Work Defined Practice* and is accountable to the IA for the safe, responsible and reliable delivery of all assigned permitted work activities. The PA could be performing a task or supervising a group that is performing a task. The PA shall participate in the risk assessment for the planned activity and shall sign the work permit acknowledging the requirements and scope of work of the permit.

Area Authority ("AA") – The AA is the ARC Project Manager or designated substitute (BP RM employee). The primary contractor or a subcontractor cannot be the AA. The AA has the responsibility to verify that all work activities are consistent with RM HSSE practices, identify objectives and performance standards for planned activities, and shall authorize all work activities. The AA has the authority to approve MOC requests, however, some MOCs may require a higher level of approval.

Person In Charge ("PIC") – The Site PIC is responsible for coordinating among multiple contractor PICs, IAs and PAs working at one RM premises to confirm safe, responsible and reliable delivery of all work activities. The Site PIC is an on-Site individual who has working knowledge of all work activities being performed by all members of the workforce. The PIC shall identify and verify all SIMOPS, including all potential interaction with other permits being issued, determine if conflicts exist between permits, and after consultation with all affected parties, shall decide the order of work to be performed.

SECTION 2.0

SITE SPECIFIC SAFETY REQUIREMENTS

2.1 Health, Safety, Security and the Environment Expectations

ARC's HSSE aspirations are – no accidents, no harm to people and no damage to the environment. ARC is committed to the protection of the natural environment, to the safety of the communities in which they operate, and to the health, safety and security of people. Everyone who works for ARC, including contractors, has a responsibility for getting HSSE right.

Health, Safety and Security. ARC is committed to providing all workers with a safe and secure work environment where no one is subject to unnecessary risk. No activity is so important that it can not be done safely. ARC's commitment to safety means that each member of the workforce needs to be alert to safety risks as they go about their jobs (i.e., simply obeying safety rules is not enough).

Basic rules to be followed:

Always:

- Comply with the requirements of the HSSE management system at the work location – including the use of relevant standards, instructions and processes – and with the Golden Rules of Safety.
- Stop any work that becomes unsafe.
- Only complete work for which you are trained, competent, medically fit and sufficiently rested and alert to carry out.
- Know what to do if an emergency occurs at the place of work.
- Help ensure that those who you work with – employees, contractors and other third parties – act consistently with ARC's HSSE commitments.
- Promptly report to local ARC management any accident, injury, illness, unsafe or unhealthy condition, incident, spill, or release of material to the environment, so that steps can be taken to correct, prevent or control those conditions immediately. Never assume that someone else will report a risk or concern.

Never:

- Undertake work when performance is impaired by alcohol or other drugs, legal or illegal, prescribed or otherwise.
- Possess, use or transfer illegal drugs or other substances at the work Site or while conducting other project related business.
- Use threats, intimidation, or other violence at work, or bring weapons – including those carried for sporting purposes – onto the work Site.

Environment. In addition to fully complying with all legal requirements, ARC and its contractors will constantly strive to drive down the environmental and health impact of their operations through the responsible use of natural resources and the reduction of waste and emissions. These challenges apply to all parts of the business and to all worksites and workplaces. Working to protect the natural environment and the health and safety of the communities in which it operates is a core commitment of ARC.

2.2 Control of Work

Control of Work ("CoW") is the 'umbrella requirement' that applies to all Site work for the purpose of identifying hazards and having procedures in place to control those hazards. The following sections summarize the ARC requirements that are further detailed in the individual defined practice documents included in the BC HSP. Copies of required forms or permits are provided in Appendix B.

2.2.1 CoW Practice

For all phases of work at the Site, it is necessary to follow and document the 4-step CoW planning process which includes: 1) define/plan, 2) assess risks, 3) implement safety controls and 4) complete the action [See also BC HSP: 201 Control of Work Defined Practice]. These four steps should be followed for each phase including:

- Site – initial Site evaluation and planning
- Project – each sub-project completed at the Site (i.e. groundwater investigation, soil investigation, O&M activities)
- Job – within each project there are often several jobs (i.e. drilling, well installation, well development, sampling)
- Task – each job is usually completed through several tasks (i.e. installing sample pump, setting up power supply, purging well, filling sample bottles).

2.2.2 CoW Permit

A work permit shall be required for high risk activities such as ground disturbance, hot work, confined space entry, working near live overhead utilities, lifting operations, and working at heights. The permit is used to document the hazards and controls and the work may not be conducted until the permit is approved through the review and signature of the designated 'Issuing Authority'. [See also BC HSP: 205 Control of Work Permit Defined Practice.]

2.2.3 Ground Disturbance (Drilling and Excavation)

A 'Ground Disturbance Permit' is required before conducting any activity that results in ground disturbance (i.e. drilling, trenching, post hole digging). The dig zone shall be evaluated for the presence of buried utilities through several methods including public one-call service, private utility locator, review of Site as-built documents and hand clearance to 6.5 feet. [See also BC HSP: 230 Ground Disturbance Defined Practice.]

2.2.4 Hot Work

Any work that uses or creates a heat source, spark or open flame (i.e. welding, cutting) requires the use of an authorized *Hot Work Permit*. The work area must be evaluated for flammable or combustible hazards as well as a potential hazardous atmosphere. [See also BC HSP: 245 Hot Work Defined Practice.]

2.2.5 Confined Spaces

Entry into confined spaces (as defined by OSHA) shall require a *Confined Space Entry Permit* and shall only be done by trained and authorized persons. The confined space must be evaluated for hazards including atmospheric, engulfment, entrapment, and temperature. [See also BC HSP: 215 Confined Space Defined Practice.]

2.2.6 Overhead Utilities

Work conducted within a specific distance from overhead utilities (i.e. power lines, communication lines, guy wires) shall be assessed and approved using an *Overhead Utilities Permit*. For live power lines, the minimum safe working distance is dependant on the line voltage. [See also BC HSP: 260 Overhead Utilities Defined Practice.]

2.2.7 Lifting Operations

Lifting operations includes the use of cranes, hoists, slings or other lifting equipment to lift and move heavy loads. Lifts can be subdivided into 'critical' and 'non-critical' depending on the weight of the load and the rating of the lifting equipment. Only trained and authorized persons are allowed to participate in critical lifts. A *Lifting Operations Permit* must be completed for all critical and non-critical lifts. [See also BC HSP: 250 Lifting Operations Defined Practice.]

2.2.8 Working at Heights

Working at heights is defined as all work done at 6 feet or more above ground level where there is no protective system or railing installed including working from a ladder, elevated work platform or around an unprotected opening. Fall arrest equipment is often required for this work. A *Working at Heights Permit* is required to be completed before the work begins. [See also BC HSP: 290 Working at Heights Defined Practice.]

2.2.9 Energy Isolation

Energy isolation is the process of isolating the work area from any potential energy sources including electrical, mechanical, hydraulic, or piping systems (liquid or gas). A work permit is not required for this type of work but an *Isolation Control Register Form* must be completed to track what systems are locked out, how long they will be locked out and what other processes may be affected by the lockout. [See also BC HSP: 220 Energy Isolation Defined Practice.]

2.2.10 Working Around Water

Work that is conducted around open bodies of water that may present a potential drowning hazard (e.g. water > 3 feet deep or has a soft bottom of sufficient thickness to become an entrapment hazard) requires additional safety precautions such as personal floatation equipment and construction design requirements if construction work activities are being done. A work permit is not required.

2.3 Work Risk Assessment

Work risk assessment is the process of assessing the risks and identifying controls for all phases of work. There are eight root sources of hazards that should be evaluated during the risk assessment including: biological, chemical, electrical, gravitational, motion, pressure, radiological, and thermal. The Work Risk Assessment Tool ("WRAT") is a semi-quantitative method used for the Site, project and job level phases. The Task Safety and Environmental Analysis ("TSEA") is a detailed assessment done for each task within a job. The combined completed package is the 'risk register' for the project. [See also BC HSP: 285 Work Risk Assessment Defined Practice]. Work risk assessments and TSEAs shall be kept in the field while work is being implemented.

2.3.1 Work Risk Assessment Tool

The *WRAT* is a spreadsheet tool that calculates a semi-quantitative risk score based on the users identification of frequency, consequence and likelihood. The risk score is calculated prior to implementation of any safety controls and then calculated again incorporating the controls identified in the risk mitigation section. The work activity should not progress unless the mitigated risk is calculated as minimal or low.

2.3.2 Task Safety and Environmental Analysis

The TSEA is a simple non-quantitative risk assessment done using the *TSEA Form* which should be used as a job planning tool and done shortly before implementation of the work. At least one member of the work team performing the specific task(s) shall participate in the performance of the TSEA. For routine work that is done the same way each time, the TSEA may be completed in advance and then reviewed by the workforce each time the task is completed.

The four basic steps in completing a TSEA are:

1. Select the job to be analyzed;
2. Break the job down into successive steps or activities and observe how these actions are performed;
3. Identify the hazards and potential accidents; and
4. Develop safe job procedures to eliminate the hazards and prevent the potential accidents.

2.4 Daily Toolbox Meeting

Daily toolbox meetings shall be held at the start of each work day, shift or task change. The daily toolbox meetings shall review the planned work activities for the day, discuss and resolve the risks and mitigations, discuss any HSSE concerns and raise the HSSE consciousness of each worker before they start work. The *Daily Toolbox Meeting Record* shall be used to document the meeting and the topics discussed. It will also be used to document work status at the completion of work for the day including whether there were any near-miss incidents, accidents, or safety recommendations and whether the work Site was left in a safe condition. All workers shall sign the form daily and document that they are 'fit for work' at the start and end of the day. Daily toolbox meetings should be held in a safe and comfortable environment, free from weather, environmental hazards and excessive background noise. [See also BC HSP: 280 Daily Toolbox Meeting Defined Practice.]

2.5 Stop Work Authority

All members of the workforce shall be made aware of their obligation to 'Stop Work' that they consider to be unsafe and that they have the authority, obligation and responsibility to stop any task or operation where there are concerns or questions regarding the control of the hazards or risks associated with a task or operation that is being performed.

No work will resume until all 'Stop Work' concerns or questions have been adequately addressed and associated risks have been eliminated or mitigated to acceptable levels. All instances of work being stopped for reasons of safety shall be recorded, properly investigated and the results recorded, either on the *Daily Toolbox Meeting Record* or incident investigation form. [See also BC HSP: 275 Stop Work Defined Practice.]

2.6 Short-Service Employees

Short-service employees ("SSE") are BC or subcontractor employees that have been in their assigned job position for less than 6 months. SSE are considered to still be in training and will be assigned a mentor to monitor their training, approve their job assignments, review their HSSE performance and provide counseling on areas that need improvement. SSE shall wear a differently colored hard hat (designated as orange for the Yerington Site) to differentiate them from more experienced workers. SSE may graduate from SSE status after 6 months and with the approval of their supervisor and/or mentor as long as they can demonstrate a knowledge of their job requirement and safe work practices. Documentation of graduation shall be retained in Site training records. [See also BC HSP: 210 Contractor HSSE Management and Assurance Defined Practice.]

2.7 Simultaneous Operations (SIMOPS)

A SIMOP is defined as one or more activities (e.g., tasks, jobs, projects) or work taking place at the same time, with the potential to affect one another. Specifically, SIMOPS is multiple RM operations or RM operations and non-RM operations occurring concurrently in sufficient

proximity that one operation creates a hazard for another, or new hazards are created. A SIMOPS plan should be prepared to identify responsibilities and coordinate activities and a *person in charge (PIC)* should be designated as the primary coordinator. All risk assessment planning documents shall evaluate the additional hazards that may exist because of the SIMOPs. Work permits and daily toolbox meeting forms shall be signed by the PIC. [See also BC HSP: 265 Simultaneous Operations Defined Practice.]

2.8 Management of Change

Management of change ("MoC") is a controlled system to document changes from previously established practices and to evaluate those changes for risks. There are three types of change: administrative, organizational and technical. An administrative change is a modification to policies, procedures, process and forms. An organizational change is any modification that affects the organization structure, personnel with specific knowledge or experience, authority, level, etc. Technical changes are modifications to facilities or processes including use of different equipment, engineering design, or safety design. Proposed changes shall be evaluated to determine if they have a significant potential impact on HSSE or operating efficiency and if so and MoC request should be submitted to the project manager. The ARC PM will determine if approval of the MoC may be done by BC management (at the Vice President level), otherwise MOC approvals shall be made by the ARC Project Manager, HSSE Advisor or other designated approver. [See also BC HSP: 255 Management of Change Defined Practice.]

2.9 Project HSSE Plan

Because of the complexity and long-term duration of work at this project Site, individual HSSE Plans will be developed for each implemented project (i.e. Process Area Investigations, Evaporation Pond Closure, Groundwater Monitoring). The HSSE Plan will detail the specific safety requirements applicable for that project and may include:

- Project specific training requirements;
- Project specific CoW requirements;
- Project specific air monitoring requirements and action levels;
- Project specific emergency response requirements;
- Roles and Responsibilities;
- SIMOP Work Plan; and
- Communication Plan.

SECTION 3.0
TRAINING REQUIREMENTS

The Site falls under the jurisdiction of OSHA and all workers at the Site must receive training as specified by OSHA in 29 CFR 1910 (General Industry) and 29 CFR 1926 (Construction). It is the responsibility of every employer to determine the training requirements for their employees based on the work activities they will be involved in. Additionally, OSHA mandates training requirements for workers involved in hazardous waste operations ("HAZWOPER") as specified in 29 CFR 1910.120.

3.1 General Training Requirements

All primary contractors and subcontractors performing environmental work at the Yerington Mine Site shall be required, at the minimum, to have the following training:

1) OSHA 40 hour HAZWOPER with current annual 8 hour refresher. In some cases, 24 hr HAZWOPER may be acceptable at the discretion of the Project Manager. This includes:
   - Hazard recognition
   - Hazard communication
   - PPE selection
   - Emergency response (awareness level)
2) Yerington Site-Wide Health and Safety Plan. This includes:
   - Roles and responsibilities
   - Personnel training requirements
   - Hazard assessment
   - Personal protective equipment to be used
   - Site control measures
   - Emergency response
   - Decontamination plan
   - Incident reporting procedures
3) ARC HSSE Expectations

Training certificates must be kept on file at the project Site or at the contractors local office where they must be easily accessible and available on request. Documentation of additional Site specific training shall be maintained at the Site such as attendance records for training sessions and acknowledgement of receipt of the HASP.

3.2 Pre-Entry Briefing

All personnel, including short-term visitors and Site workers, will be required to have a Site briefing prior to their first entry onto the Site. The introductory briefing is conducted through a video training presentation and includes two training modules for 1) all individuals entering the

Site and 2) a Site workers supplement. Trainees will document their understanding of the basic HSSE requirements through a quiz upon completion of the training and shall also provide emergency contact information on the same form. Elements to be covered in the Site briefing include:

- Site contact information;
- Site security;
- Emergency response procedures;
- Emergency muster location;
- Personal protective equipment requirements;
- Prohibited items and substances;
- Site-specific safety and health hazards; and
- Safe work practices and driving safety.

3.3 Training Matrix

Site workers will require different levels of training on various HSSE topics depending on their work assignment. A training matrix has been prepared and is included as Appendix C to indicate the training requirements depending on their job classification or HSSE role. Table C1 in Appendix C identifies the training requirements for Brown and Caldwell employees and is not applicable for other subcontracted Site workers; subcontractors shall have their own training program requirements specified in their own company H&S Program. Table C2 identifies the Yerington Mine specific training requirements and is applicable for all Site workers, including subcontractors. Site workers shall be trained to an 'awareness level' or 'competent level' as required depending on their level of involvement in tasks.

Records of all training shall be maintained and a method to determine the trainee's understanding and competence shall be developed and documented (i.e. written quiz or observation of operation of equipment).

3.4 Medical Surveillance

Site personnel, including subcontractors and Site visitors, who will or may work in areas where exposure to hazardous or toxic substances is likely must have fulfilled the appropriate medical monitoring requirements in accordance with 29 CFR 1910.120(f). These individuals must have successfully completed an annual surveillance examination and/or an initial baseline examination within the last 12 months.

3.5 Confined Space Entry

Work activities conducted in permit-required confined spaces require specialized training on the hazards, safety controls and roles and responsibilities of participants at a detailed level to be competent in the requirements. Competence level training shall be documented and should include:

- How to recognize and evaluate a confined space;
- Atmosphere hazards, monitoring procedures and limits;
- Physical hazards (i.e. engulfment, entrapment);
- Roles of the authorized entrant, attendant, and entry supervisor;
- Safety equipment;
- Emergency rescue procedures; and
- Use of the confined space entry permit.

3.6 Lockout/Tagout

Authorized workers conducting LO/TO energy isolation on equipment shall receive specific training on the LO/TO procedures, including training on electrical hazards and safety procedures. Workers shall be trained on LO/TO devices, shut down procedures, startup procedures, notifications to affected persons, release of stored energy, and verification of isolation.

3.7 Heavy Equipment Operation

Heavy equipment operators shall be required to provide documentation of competence for each piece of equipment they will operate at the job Site. Competence must be evaluated and signed by a competent trainer who understands the operating requirements of the piece of equipment.

SECTION 4.0
HAZARD ANALYSIS

Hazards at the Site may include chemical, radiological, physical or biological hazards. Each type of identified hazard is addressed in the following sections. Detailed project related hazards will be evaluated in work risk assessment documents and TSEAs as part of each project risk record.

4.1 Chemical Hazards

This section provides a brief discussion of the chemicals and metals present in typical mine tailings or process solutions or that may be used at the Site during investigation, remediation or operations and maintenance ("O&M") activities. The sources to which personnel may potentially be exposed to harmful chemicals consist primarily of:

- Metal contaminated soils or water;
- Airborne dust containing metals;
- Acidic solutions; and
- Hydrocarbon fuels (e.g., diesel or gasoline).

Exposure pathways of concern for chemical compounds that may be present at the Site are inhalation of airborne contaminants, direct skin contact with contaminated materials, and incidental ingestion of affected media. Wearing protective equipment and following decontamination procedures can minimize dermal contact and incidental ingestion. To minimize inhalation hazards, dust or vapor control measures will be implemented, where necessary, and action levels will be observed during scheduled activities. Site-specific action levels and air monitoring requirements shall be presented in individual Project HSSE Plans.

Chemical descriptions of chemicals of concern, including health effects and exposure limits, are presented in the following paragraphs. Each chemical description includes physical and odor recognition characteristics, the health effects associated with exposure, and exposure limits expressed as an 8-hour time-weighted average (TWA). Provided are federal OSHA (OSHA) permissible exposure limits (PELs; located in 29 CFR 1910.1000); California OSHA (Cal/OSHA) PELs (located in 8 CCR 5155); and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs). For Sites outside California, Cal/OSHA PELs are included as an additional reference.

Arsenic. Metallic arsenic is most commonly a gray, brittle, crystalline solid. It can also be in a black or yellow amorphous form. Arsenic is also commonly found in its volatile white trioxide form. Arsenic is used in several insecticides, herbicides, defoliants, desiccants, and rodenticides and appears in a variety of forms. It is also used in tanning, pigment production, glass manufacturing, wood preservation, and anti-fouling coatings. Arsenic is classified as a known carcinogen.

Short-term exposure to arsenic can cause marked irritation of the stomach and intestines with nausea, vomiting, and diarrhea. In severe cases the vomiting and stools are bloody and the exposed individual goes into collapse and shock with weak, rapid pulse, cold sweats, coma, and death. Inorganic arsenicals are more toxic than organic arsenicals, and the trivalent form is more toxic than the pentavalent form. Acute arsenic poisoning usually results from ingestion exposures. Blood cell changes, blood vessel damage, and impaired nerve function can also result from chronic arsenic ingestion. Other effects include skin changes, irritation of the throat, increased risk of cancer of the liver, bladder, kidney, and lung.

- The OSHA PEL is listed as 0.01 mg/m3 for inorganic forms of arsenic and 0.5 mg/m3 for organic forms.
- The TLV is listed as 0.01 mg/m3 for arsenic and inorganic arsenic compounds.

WARNING: This chemical is known to the State of California to cause cancer, birth defects or other reproductive harm.

Asbestos. Asbestos may be solid, crystals or crystalline, or fibrous in appearance, and comprises hydrated, fibrous silicates. It is light or pale gray in color and odorless.

There are two groups of asbestos mineral. The first is the serpentine group, commonly referred to as chrysotile. Chrysotile, which comprises approximately 93% of all asbestos in use in the United States, is characterized by long, soft and flexible strands that can be woven into a cloth. The second category occurs as a group of minerals called amphiboles. Amphibole fibers are characterized as being strong, brittle, and needle-like. The common names of the forms of the minerals within this group are crocidolite, amosite, tremolite, anthophyllite, and actinolite. Asbestos was formerly very popular for use in building materials and industry.

Dust from this material can be hazardous when inhaled. Exposure to asbestos dust can cause irritation of eyes and mucous membranes, upper respiratory irritation, delayed and often serious breathing problems, and stomach upsets. Asbestos can produce a lung fibrosis called asbestosis. The onset of asbestosis is usually gradual, developing over a period of 10 to 30 years of exposure to significant concentrations of asbestos. It is characterized by development of a thickening of the lung pleura (lining).

Asbestos is also a cancer-producing agent (lung cancer and mesothelioma, among others). Heavy exposure to dust containing asbestos can also cause skin irritation. Epidemiological studies have shown that lung cancer appears to be related to the degree of exposure, the type of asbestos and whether or not the individuals smoke cigarettes. It is significant that cigarette smoking greatly increases the risk of lung cancer in those who are exposed to asbestos. However, mesothelioma (a rare tumor of the chest cavity lining) appears to develop without regard to the amount of asbestos inhaled.

- The OSHA PEL is listed as 0.1 fibers per cubic centimeter (f/cc).
- The TLV is listed as 0.1 f/cc.

WARNING: This chemical is known to the State of California to cause cancer.

Copper. In its elemental form, copper is a common metal with a distinct reddish color. Human systemic effects by ingestion include nausea and vomiting. In animals, inhalation of copper dust has caused hemolysis of the red blood cells, deposition of hemofuscin in the liver and pancreas, and injury to the lung cells. Short-term exposure to copper dust can cause a feeling of illness similar to the common cold with sensations of chills and stuffiness of the head. Small copper particles may enter the eye and cause irritation, discoloration, and damage.

- The OSHA PEL is listed as 0.1 mg/m3 for copper as a fume, and 1.0 mg/m3 for dust.
- The TLV is listed as 0.2 mg/m3 for copper as a fume, and 1.0 mg/m3 for dust.

Corrosives (acids, bases, and oxidizers). Corrosives are strong irritants of the eyes, mucous membranes, and skin. Inhalation may cause upper respiratory irritation, and exposure to skin and mucous membranes may cause chemical burns. Repeated exposure of skin may cause dermatitis. Examples of common corrosives are hydrochloric acid (acid), sodium hydroxide (base), and hydrogen peroxide (oxidizer). Appropriate gloves should be worn whenever corrosives are handled. Exposed skin or mucous membranes should be immediately rinsed with water for at least 15 minutes. Oxidizers react strongly with combustible materials and may cause fires.

The above information is provided for a class of compounds. OSHA PELs, Cal/OSHA PELs, and TLVs (if listed) vary by specific compound.

Crystalline Silica. Crystalline silica is moderately toxic as an acute irritating dust. The prolonged inhalation of dusts containing free silica may result in the development of a disabling pulmonary fibrosis known as silicosis. The action of crystalline silica on the lungs results in the production of a diffuse, nodular fibrosis in which the parenchyma and the lymphatic systems are involved. This fibrosis is, to a certain extent, progressive, and may continue to increase for several years after exposure is terminated.

- The OSHA PEL is determined by using the formula specified in 29 CFR 1910.1000, Table Z-3.
- The TLV is listed as 0.05 mg/m3 for respirable alpha-quartz and cristobalite.

Diesel Fuel. Diesel fuel is a gas oil fraction available in various grades as required by different engines. Composition of diesel varies in ratios of predominantly aliphatic, olefinic, cycloparaffinic, aromatic hydrocarbons, and additives.

It is a severe skin irritant and ingestion of diesel can lead to systemic effects such as gastrointestinal irritation, vomiting, diarrhea, and, in severe cases, drowsiness and central nervous system depression, progressing to coma and death. Absorption of diesel fuel can cause hemorrhaging and pulmonary edema, progressing to pneumonitis and renal involvement. It is combustible when exposed to heat or flame, and can react with strong oxidizing materials.

- No OSHA PEL is listed for diesel.
- The TLV is listed as 100 mg/m3 as total hydrocarbons (vapor and aerosol).

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

WARNING: The exhaust from this chemical is known to the State of California to cause cancer.

Gasoline. Gasoline is produced from the light distillates during petroleum fractionation. Its major components include paraffins, olefins, naphthenes, aromatics, and recently ethanol. Gasoline also contains various functional additives as required for different uses, such as antiknock fluids, antioxidants, metal deactivators, corrosion inhibitors, anti-icing agents, preignition preventers, upper-cylinder lubricants, dyes, and decolorizers. Lead additives in particular were widely used in gasoline until the introduction of vehicle catalytic converters.

Mild cases of gasoline ingestion can cause inebriation, vomiting, vertigo, drowsiness, confusion, and fever. Aspiration into the lungs and secondary pneumonia may occur unless prevented. Gasoline can cause hyperemia of the conjunctiva and other eye disturbances. Gasoline is a skin irritant and a possible allergen. Repeated or chronic dermal contact can result in drying of the skin, lesions, and other dermatologic conditions.

- No OSHA PEL is listed for gasoline.
- The TLV is listed as 300 ppm.

WARNING: The exhaust from this chemical is known to the State of California to cause cancer.

Heavy Waste Oils. Heavy waste oils, including lubricants, grease, and used motor and hydraulic fluids, have been shown to cause skin cancer during prolonged dermal exposure in laboratory animals. Therefore, dermal protection must be provided when contact with used oil is suspected. Contaminated skin should be washed as soon as possible. The above information is provided for a class of compounds. OSHA PELs and TLVs (if listed) vary by specific compound.

Lead. Lead (inorganic) is a bluish-white, silver or gray odorless solid. Short-term exposure to lead can cause decreased appetite, insomnia, headache, muscle and joint pain, colic, and constipation. Considerable data exist on the effects of lead exposure in humans. It is a poison by ingestion and a suspected human carcinogen of the lungs and kidneys. There are data to suggest that lead is a mutagen and can cause reproductive effects. Human systemic effects by ingestion and inhalation (the two routes of absorption) include loss of appetite, anemia, malaise, insomnia, headache, irritability, muscle and joint pains, tremors, flaccid paralysis without anesthesia, hallucinations and distorted perceptions, muscle weakness, gastritis, and liver changes. Recent experimental evidence suggests that blood levels of lead below 10 µg/dl (micrograms per deciliter) can have the effect of diminishing the IQ scores of children.

- The OSHA PEL is listed as 0.05 mg/m3 and the OSHA PEL for tetraethyl lead and tetramethyl lead is listed as 0.075 mg/m3.
- The TLV for elemental lead is listed as 0.05 mg/m3, the TLV for tetraethyl lead is 0.1 mg/m3 and the TLV for tetramethyl lead is 0.15 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact (to organic forms) can contribute to the overall exposure.

WARNING: This chemical is known to the State of California to cause cancer, birth defects or other reproductive harm.

Motor Oil. Motor oil is a dark viscous liquid. It is composed of aliphatic, olefinic, naphthenic (cycloparaffinic), and aromatic hydrocarbons, as well as additives depending on specific uses. Motor oil has a burning lubricating oil odor. Short-term exposure via dermal contact with motor oil can cause irritation to the skin and dermatitis. Inhalation of motor oil can cause aspiration. Target organs are the upper respiratory system and the skin.

- No OSHA PEL or ACGIH TLV is listed for motor oil.

Nuisance Dust (Total and Respirable). Nuisance dusts vary in toxicity depending upon composition. They can cause local irritation of the eyes, nose, throat, and lungs. Inhalation of some dusts may lead to bronchitis, emphysema, and bronchial asthma. Nuisance dusts do evoke some tissue response in the lung upon inhalation of sufficient amounts. However, this reaction is potentially reversible and may leave no scar tissue.

- The OSHA PEL is listed as 15 mg/m3 for total dust, and 5 mg/m3 for the respirable fraction.
- The TLV is listed as 10 mg/m3 for inhalable particles, and 3 mg/m3 for the respirable (inhalable) fraction.

Petroleum Hydrocarbons. Petroleum distillates (naphtha) are mildly toxic by inhalation. They can cause unconsciousness, dyspnea, and a bluish tint to the skin. Recovery follows after removal from exposure. In mild form, intoxication resembles drunkenness. On a chronic basis, no true poisoning occurs; however, effects may include headache, lack of appetite, dizziness, sleeplessness, indigestion, and nausea. It is combustible when exposed to heat or flame and can react with oxidizing materials.

- The OSHA PEL is listed as 500 ppm (as petroleum distillates).
- The TLV is listed as 300 ppm (as VM&P naphtha), 100 ppm (as stoddard solvent), and 300 ppm (as gasoline).

Polychlorinated Biphenyls (PCBs). PCBs are a series of technical mixtures consisting of many isomers and compounds that vary from mobile oil liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch. Generally, they are moderately toxic by

ingestion, and some are poisons by other routes. Most are suspect human carcinogens and experimental tumorigens, and exhibit experimental reproductive effects. They have two distinct actions on the body: a skin effect (chloracne) and a toxic action on the liver. The higher the chlorine content, the more toxic the PCBs tend to be.

- The OSHA PEL is listed as 0.5 mg/m3 for 54% chlorine content (as a PCB) and 1.0 mg/m3 for 42% chlorine content (as a PCB).
- The TLV is listed as 0.5 mg/m3 for 54% chlorine content (as a PCB) and 1.0 mg/m3 for 42% chlorine content (as a PCB).

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

WARNING: This chemical is known to the State of California to cause cancer, birth defects or other reproductive harm.

Radium. Radium is a highly radiotoxic radioactive earth metal. Radium 226, a member of the uranium-238 decay series, is the parent of radon-222 and radium 228 is a member of the thorium decay series. It was formerly a common constituent of luminous paints. Inhalation, ingestion, or bodily exposure can lead to lung cancer, bone cancer, osteitis, skin damage, and dyscrasias. Radium replaces calcium in the bone structure and is a source of irradiation to the blood-forming organs.

- No OSHA PEL or TLV is listed for radium.

Uranium. Uranium is a heavy, silvery-white, radioactive metallic element. Uranium is highly toxic on an acute basis. Soluble uranium compounds may be absorbed through the skin. The rapid passage of soluble uranium compounds through the body tends to allow relatively large amounts to be absorbed. The high toxicity effect of insoluble compounds is largely due to lung irradiation by inhaled particles.

- The OSHA PEL is listed as 0.05 mg/m3 for soluble and insoluble compounds.
- The TLV is listed as 0.2 mg/m3 for soluble and insoluble compounds.

4.2 Radiological Hazards

Radioisotopes have been found to occur in the soils, tailings and sediments at the Site which have originated from naturally occurring radioactive materials ("NORM") in the ores that were mined for their copper content. The processing of these ores has resulted in the concentration of some radiochemicals in the process solutions, tailings and waste streams. Such concentrated radiochemicals are termed technologically enhanced naturally occurring radioactive materials ("TENORM"). The chemical hazards of the radioisotopes that may be found at the Site are discussed in the previous section (Section 4.1) while the radiation energy hazards are discussed here.

Ionizing radiation is the energy that is emitted by radioisotopes as they decay. There are three main kinds of ionizing radiation given off from decaying radiochemicals: (α) alpha particles (low penetrability); (β) beta particles (medium penetrability), and (γ) gamma rays (high penetrability).

- The OSHA PEL for radiation energy sources is 5 rem per year (or 1 ¼ rem per calendar quarter).

Alpha particles. Most alpha emitters occur naturally in the environment. For example, alpha particles are given off by uranium-238, radium-226 and other members of the uranium-238 decay series. Alpha particles do not travel far from their source, generally no more than 12 inches in air, can be stopped by solid materials the thickness of a piece of paper, and travel relatively slowly due to their electric charge and large mass.

The health effects of alpha particles depend heavily upon how exposure takes place. External exposure (external to the body) is of far less concern than internal exposure, because alpha particles lack the energy to penetrate the outer layer of dead skin. However, if alpha emitters have been inhaled, ingested (swallowed) or absorbed into the blood stream, sensitive living tissue can be exposed to alpha radiation. The resulting biological damage increases the risk of cancer; in particular, alpha radiation is known to cause lung cancer in humans when alpha emitters are inhaled. The greatest exposure to alpha radiation for average citizens comes from the inhalation of radon and its decay products, several of which also emit alpha radiation.

Beta particles. Beta particles are subatomic particles ejected from the nucleus of some radioactive atoms. They are equivalent to electrons. Often, gamma ray emission accompanies the emission of a beta particle. Beta particles travel several feet in open air and are easily stopped by solid materials.

Gamma Radiation. A gamma ray is a packet of electromagnetic energy known as a photon. Gamma photons are the most energetic photons in the electromagnetic spectrum. Gamma rays are emitted from the nucleus of some unstable (radioactive) atoms. Because of their high energy, gamma photons travel at the speed of light and can cover hundreds to thousands of meters in air before spending their energy. They can pass through many kinds of materials, including human tissue. Very dense materials, such as lead, are commonly used as shielding to slow or stop gamma photons.

Most exposure to gamma and x-rays is direct external exposure. Most gamma and x-rays can easily travel several meters through air and penetrate several centimeters in tissue. Some have enough energy to pass through the body, exposing all organs. Because of the gamma ray's penetrating power and ability to travel great distances, it is considered the primary hazard to the general population during most radiological emergencies.

4.3 Physical Hazards

The following physical hazards have been identified and may be encountered during scheduled field activities. Actions to be taken to protect against the hazards identified are provided in the sections below.

- ✓ Slips, Trips and Falls
- ✓ Heavy Equipment
- ✓ Excavations
- ✓ Noise
- ✓ Overhead Utilities
- ✓ Electrical Equipment
- ✓ Confined Spaces
- ✓ Sunburn
- ✓ Cold Stress
- ✓ Sharp Objects/Cutting
- ✓ Elevated Platforms
- ✓ Traffic
- ✓ Pit Highwall Stability
- ✓ Housekeeping
- ✓ Materials and Equipment Handling - Lifting
- ✓ Drilling
- ✓ Underground Utilities
- ✓ Equipment Refueling
- ✓ Lockout/Tagout
- ✓ Fire
- ✓ Heat Stress
- ✓ Adverse Weather/Electrical Storms
- ✓ Inadequate Lighting
- ✓ Ladder Use
- ✓ Driving
- ✓ Water Hazards

4.3.1 Slip, Trips and Falls

Slipping hazards may exist due to uneven terrain, wet or slick surfaces, leaks or spills. Tripping hazards may be present from elevation changes, debris, poor housekeeping or tools and equipment. Some specific hazards may include: climbing/descending ladders, scaffolding, berms or curbing. Collectively, these types of injuries account for nearly 50 percent of all occupational injuries and accepted disabling claims. Prevention requires attention and alertness on the part of each worker and following and enforcing proper procedures, including good housekeeping practices.

4.3.2 Housekeeping

Personnel shall maintain a clean and orderly work environment. Make sure that all materials stored in tiers are stacked, racked, blocked, interlocked, or secured to prevent sliding, falling, collapse, or overturning. Keep aisles and passageways clear and in good repair to provide for free and safe movement of employees and material-handling equipment. Do not allow materials to accumulate to a degree that it creates a safety or fire hazard.

During construction activities, scrap and form lumber with protruding nails and other items shall be kept clear from work areas, passageways, and stairs. Combustible scrap and debris shall be removed at regular intervals. Safe means must be provided to facilitate removal of debris.

Containers must be provided for collecting and separating waste, used rags and other debris. Containers used for garbage and other oily flammable or hazardous waste such as caustics, acids, harmless dusts, etc., must be separated and equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

4.3.3 Heavy Equipment

Equipment, including earth-moving equipment, drill rigs, or other heavy machinery, will be operated in compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. The operator is responsible for inspecting the equipment prior to use each work shift to verify that it is functioning properly and safely. Operators shall provide documentation of competency to operate each piece of heavy equipment used.

The following precautions should be observed whenever heavy equipment is in use.

- Personnel must be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of its operation. Workers must never assume that the equipment operator sees them; eye contact and hand signals should be used to inform the operator of the worker's intent.
- Personnel should not walk directly in back of, or to the side of, heavy equipment without the operator's knowledge. Workers should avoid entering the swing radius of equipment and be aware of potential pinch points.
- Nonessential personnel will be kept out of the work area.

4.3.4 Materials and Equipment Handling - Lifting

The movement and handling of equipment and materials on the Site pose a risk to workers in the form of muscle strains and minor injuries. These injuries can be avoided by using safe handling practices, proper lifting techniques, and proper personal safety equipment such as steel-toed boots and sturdy work gloves. Where practical, mechanical devices will be utilized to assist in the movement of equipment and materials. Individuals should not attempt to lift loads weighing more than 50 pounds and should enlist the help of another person or use a mechanical aids, such as drum dollies or hydraulic lift gates, for loads heavier than 50 pounds.

Proper lifting techniques include the following:

- Lift with the strength of your knees, not your back.
- Firmly plant your feet approximately shoulder-width apart.
- Turn your whole body, don't bent or twist at the waist.
- Be sure that the path is clear of obstructions or tripping hazards; avoid carrying objects that will obstruct your vision.
- Use caution when holding an object from the bottom to prevent crushing of the hands or fingers when lowering.

4.3.5 Excavations

Excavations shall be done in accordance with BC HSP 230 Ground Disturbance Defined Practice and requires the use of a *Ground Disturbance Permit* to review of hazards and identification of safety controls. If the atmosphere is determined to be hazardous or potentially hazardous, a *Confined Space Entry Permit* will also be required to enter the excavation.

A competent person who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them, will be present during excavation activities.

The atmosphere will be tested in excavations, before employees are permitted to enter and begin work, greater than 4 feet in depth or where oxygen deficiency (<19.5 %), oxygen enrichment (>23.5%) or toxic or flammable gases are likely to be present. The atmosphere shall be ventilated and re-tested until flammable gas concentrations less than 10 percent of the lower explosive limit ("LEL") and Site-specific action levels are obtained. Worker entry will not be allowed if the oxygen concentration is less than 19.5 percent. In addition, a safe means of access and egress (i.e., a ladder, stairs or ramp) must be provided so that no more than 25 feet of lateral travel is required by employees.

Workers will not enter unstable excavations or excavations greater than 5 feet in depth without appropriate protective systems such as benching, sloping, or shoring. If shoring or shielding systems are not used, side slopes will not be steeper than 1½:1 without written confirmation from the competent person that slope is safe for the soil conditions. Excavations will be constructed in accordance with the OSHA Excavation Safety Standard (29CFR1926 Subpart P).

The competent person will inspect excavations daily. If there is evidence that a cave-in or slide is possible, work will cease until the necessary safeguards have been taken. Excavated material will be placed far enough from the edge of the excavation (a minimum of 2 feet) so that it does not fall back into the opening or affect the integrity of the sidewall. At the end of each day's activities, open excavations will be clearly marked and secured to prevent nearby workers or unauthorized personnel from entering them. Remote sampling techniques will be the preferred method of sample collection in excavations.

4.3.6 Drilling

Drilling activities shall be done in accordance with BC HSP 225 Environmental Drilling Defined Practice and requires the use of a *Ground Disturbance Permit.*

During all drilling activities, the operator must ensure that the appropriate level of protection and appropriate safety procedures are utilized. The operator will verify that equipment 'kill switches' are functioning properly at the start of each day's use. Minimum Site PPE will be required at all times when working around drill rigs. The proximity of underground and overhead utilities must be identified before any drilling is attempted. The rig may not be moved with the mast in the upright position.

Workers can effectively manage hazards associated with working around heavy equipment if a constant awareness of these hazards is maintained. These hazards include the risk of becoming physically entangled in rotating machinery, slipping and falling, impact injury to eyes, head and body, and injury from machinery operations. Never work or walk on piles of well casings. Make sure all high-pressure lines and hoses have whip checks attached. Constant visual or verbal contact with the equipment operator will facilitate such awareness.

4.3.7 Noise

Noise may result primarily from the operation of heavy equipment, process machinery or other mechanical equipment. Hearing protection with the appropriate noise reduction rating ("NRR") shall be worn in areas with high noise levels. A good rule of thumb to determine if hearing protection is needed is the inability to have a conversation at arms length without raising voice levels. If loud noise is present or normal conversation becomes difficult, hearing protection in the form of ear plugs, or equivalent, will be required.

4.3.8 Underground Utilities

All activities that result in ground disturbance and potential contact with underground utilities requires the use of a *Ground Disturbance Permit* to review hazards and identify of safety controls. Reasonable efforts will be made to identify the location(s) of underground utilities (e.g., pipes, electrical conductors, fuel lines, and water and sewer lines) before intrusive soil work is performed. The state underground utility notification authority will be contacted prior to the start of intrusive field activities in accordance with local notification requirements (for Nevada use Underground Service Alert ["USA"]). In areas not evaluated or serviced by the underground utility notification authority, and a reasonable potential for underground utilities exists, one or more of the following techniques will be employed to determine the location of subsurface structures.

- Contracting the services of a qualified private utility locator.
- Having a survey of the subject area conducted by staff trained in the use of subsurface utility locating equipment.
- Subsurface testing (i.e., hand digging or potholing) to the expected depth of probable utilities (not less than 6.5 feet).

If utilities cannot be located or if unlocated utilities are suspected to be present, subsurface activities (i.e., borings, excavation) should not be conducted before the location(s) or absence of underground utilities is confirmed. Typical subsurface location marks are as follows:

- Red – electrical
- Yellow – gas/oil/steam
- Blue – water
- Green – sanitary/storm drains/culverts
- Orange – communications
- White – proposed excavation or boring

Intrusive work should be limited to the area 3.3 feet (1 meter) on either side of the location marks. In some special cases such as fiber optics and high-pressure pipelines this area should be expanded to 16.5 feet (5 meters) on either side of the utility.

4.3.9 Overhead Utilities

Work done near live overhead power lines shall be done in accordance with BC HSP 260 Overhead Utilities Defined Practice and requires the use of an *Overhead Utilities Permit.*

If work is to be conducted in the vicinity of overhead electrical utilities, the owner of the overhead line will be contacted to determine the maximum voltage. Any overhead utility will be considered to be energized unless and until the person owning or operating such line verifies that the line is not energized, and the line is visibly grounded at the work Site. Workers will not perform work in proximity to energized high-voltage lines (including scaffolding, well drilling, pile driving, or hoisting equipment) until danger from accidental contact with high-voltage lines has been effectively guarded against.

Equipment with articulated upright booms or masts are not permitted to operate within 15 feet of an overhead utility line (less than 50kV) while the boom is in the upright position. For transmission lines in excess of 50kV, an additional distance of 4 inches for each 10 kV over 50kV will be used.

At the project Site, an overhead electrical power line extends along the access road on the west side of the Evaporation Ponds and east of the Vat Leach Tails leach pad. This power line is relatively low and is aligned along the center of the access road for some distance. Signs have been placed on the access road to warn drivers that the low-clearance power lines are present. Vehicles with a height of greater than 10 feet should use an alternative access road.

4.3.10 Equipment Refueling

Care shall be exercised while refueling generators, pumps, vehicles, and other equipment to prevent fire and spills. Personnel shall eliminate static electricity by grounding themselves (touching metal) prior to using refueling hoses and or containers of petroleum liquids. Items being refueled shall be grounded or be located on the ground and not on a trailer, work bench or inside a truck bed. Equipment that is hot must be allowed to cool prior to refueling. Spill response materials shall be available when conducting refueling operations.

4.3.11 Electrical Hazards

Electrical equipment to be used during field activities will be suitably grounded and insulated. Ground-fault circuit interrupters ("GFCI"), or equivalent, will be used with electrical equipment to reduce the potential for serious electrical shock. Electrical equipment including batteries, generators, panels and extension cords shall be kept dry during use. Extension cords may not be used as a permanent means of providing power and will be removed from service if they are worn, frayed, or if the grounding prong is missing. Extension cord precautions include the following:

- Be aware of exposed or bare wires, especially on metal grating. Warning*: Electrical contact with metal can cause fatal electrocution.*
- Prior to use, inspect cords for exposed or bare wires, worn or frayed cords, and incorrect splices. Splices are permitted, but there must be insulation equal to the cable, including flexibility.
- Cables and extension cords in passageways, steps or any area where there may be foot traffic should be secured so as to not create a tripping hazard. Overhead cables and extension cords shall be rigged to a height greater than 6 feet.
- Shield extension cords that must run across driveways or areas where vehicle traffic is present.
- Do not run cords across doorways or windows where they can be frayed or cut by a closed door or window.
- Do not run wires through wet or puddled areas.
- Flexible cord sets that are used on construction sites or in damp locations shall be of hard usage or extra hard usage type.

Observation of energized machinery will take place from a safe distance. Only qualified personnel will remove guards, hatch covers, or other security devices if necessary. Equipment lockout procedures and an appropriate facility work permit requirements will be followed. Lockout/tagout procedures will be conducted before activities begin on or near energized or mechanical equipment that may pose a hazard to Site personnel. Workers conducting the operation will positively isolate the piece of equipment, lock/tag the energy source, and verify effectiveness of the isolation. Only employees who perform the lockout/tagout procedure may remove their own tags/locks. Employees shall complete lockout/tagout training before initiating this procedure.

Only qualified personnel will remove covers of electrical equipment to expose energized electrical parts. Entering electrical rooms/vaults or areas with live exposed electrical parts shall be permitted only when accompanied by a qualified personnel after notification and approval of the appropriate facility personnel.

4.3.12 Lockout/Tagout

Work done on equipment with a connected power source (e.g. electrical, gravity, hydraulic, mechanical) shall be done in accordance with BC HSP 220 Energy Isolation Defined Practice and requires documentation of affected energy sources on an *Isolation Control Register.*

Lockout/tagout ("LO/TO") procedures in accordance with 29 CFR 1910.147 will be performed before activities begin on or near energized or mechanical equipment that may pose a hazard to Site personnel. The purpose of the LO/TO system is to safeguard exposure from machinery, energized electrical circuits, piping under pressure, or any type of energy source from unexpected energization or start up that could at cause harm to an individual. Workers conducting the operation will positively isolate the piece of equipment, lock/tag the energy

source, and verify effectiveness of the isolation. Only employees who perform the lockout/tagout procedure may remove their own tags/locks. Employees must be thoroughly trained before initiating this procedure.

Whenever multiple personnel (or multiple employers are working on the same worksite) are to be engaged in activities requiring LO/TO, employees/employers shall inform each other of their activities and coordinate their respective LO/TO procedures. Whenever a group lockout/tagout procedure must be performed, they shall utilize a procedure that affords the same level of protection as that provided by the implementation of a personal lockout or tagout device. Group LO/TO devices shall meet the requirements of 29 CFR 1910.145(f)(3).

Basic Lockout/Tagout Procedures

1. Each person will maintain their own lock, key, and lockout device so that no one else can remove the lock.
2. Always notify the operator when work is to be done.
3. Use your own lock to lock out electrical power. Attach a tag or sign to the power disconnect to indicate that maintenance work is in progress. Use the wording 'Do Not Operate'.
4. Bleed all pressure from pneumatic, hydraulic, or other fluid lines, or safely isolate them from the area where work is being done.
5. Drain contents of lines or tanks as needed. Lock valves open or closed to prevent buildup of pressure.
6. Ground electrical systems as needed.
7. Secure any device under tension or compression so as to prevent accidental movement. Move suspended parts that could drop or cycle to a safe position and block, clamp, or chain them in place.
8. Verify (test) that the mechanism had been isolated from the source of energy.
9. Ensure that all workers remove their individual locks after work is completed. The last worker should remove the locking devices.
10. Ensure that the last person double-checks that all is clear and safe before start-up.

Portable Equipment

Portable electrical equipment such as hand drills, computers, and power saws that use plug type connectors must be unplugged prior to any task that may expose the employee to energized portions of the equipment. Removal of the plug from the power source, such as the generator or wall socket, may be combined with a tagout system, particularly if the plug is at a distance from the equipment being repaired.

4.3.13 Confined Spaces

Work done in a confined space shall be done in accordance with BC HSP 215 Confined Space Defined Practice and requires the use of a *Confined Space Entry Permit.*

Entry into confined spaces will be conducted in strict accordance with 29 CFR 1910.146. Confined spaces will be evaluated prior to entry to determine if hazards are present that could pose a risk to entrants. Before workers may enter a permit-required confined space, a pre-entry checklist and entry permit must be completed by the PM or SSO, approved by the RSUM and Regional Safety Manager and all requirements for entry must be met. Confined spaces may be described as having, but not being limited to, the following characteristics:

- is large enough to permit an employee to enter and perform work; and
- has limited or restricted means of entry and exit; and
- is not equipped, designed, or intended for continuous human occupancy.

If there is any serious health and safety hazard present in the confined space is considered a permit-required confined space (permit space). A permit-space is a confined space that has one or more of the following characteristics:

- contains or has the potential to contain a hazardous atmosphere; or
- contains or has the potential to contain a material with the potential to engulf or entrap an employee; or
- is so configured that an employee may become trapped, disoriented, or asphyxiated by wall configurations or floors that taper to smaller cross sections; or
- contains any other established safety or health hazard (examples may include sources of energy, moving parts or thermal considerations).

All fluid, electrical, and steam lines and other sources of energy that could harm entrants must be completely isolated before entry. The following atmospheric conditions must be met before entry is permissible (air monitoring may be necessary to verify these conditions are met):

- flammable vapor or dust must be at a concentration less than 10 percent of the LEL; and
- oxygen must be at a concentration greater than 20 percent and less than 23 percent; and
- toxic substances must be at a concentration less than their respective permissible exposure limits or specified action limits.

In addition, the following roles must be designated before entry into permit-required confined spaces is allowed: Entry Supervisor; Attendant; and Authorized Entrant(s). Confined space entry for each project also requires training for the project team on written operating procedures, including the use of Confined Space Pre-Entry Checklist and Confined Space Entry Permit forms.

If contractor employees are ***not*** trained in rescue services, such services shall be arranged locally, prior to entry operations, by the PM. Rescue services can typically be provided by the local fire department or contracted service provider.

4.3.14 Fire/Explosion

Work done using an open flame or heat source shall be done in accordance with BC HSP 245 Hot Work Defined Practice and requires the use of a *Hot Work Permit.*

Site workers should have an increased awareness concerning fire and explosion hazards whenever working with or near flammable materials, especially when performing any activity that may generate sparks, flame, or other source of ignition. Intrinsically safe equipment is required when working in or near environments with the potential for an explosive or flammable atmosphere. The SSO will verify facility requirements for a 'hot work' permit before activities that may serve as a source of ignition are conducted.

Flammable materials will be kept away from sources of ignition. In the event of fire, work will cease, the area will be evacuated, and the local fire response team will be notified immediately. Only trained, experienced fire fighters should attempt to extinguish substantial fires at the Site. Site personnel should not attempt to fight fires, unless properly trained and equipped to do so. A fully charged ABC dry chemical fire extinguisher will be readily available for use during all scheduled activities at the Site.

4.3.15 Sunburn

Working outdoors with the skin unprotected for extended periods of time can cause sunburn to the skin. Excessive exposure to sunlight is associated with the development of skin cancer. Field staff should take precautions to prevent sunburn by using sunscreen lotion on exposed skin.

4.3.16 Heat Stress

Adverse climate conditions, primarily heat, are important considerations in planning and conducting Site operations. Heat-related illnesses range from heat fatigue to heat stroke, with heat stroke being the most serious condition. The effects of ambient temperature can cause physical discomfort, loss of efficiency, and personal injury, and can increase the probability of accidents. In particular, protective clothing that decreases the body's ventilation can be an important factor leading to heat-related illnesses.

To reduce the possibility of heat-related illness, workers should drink plenty of fluids and establish a work schedule that will provide sufficient rest periods for cooling down. Personnel shall maintain an adequate supply of non-caffeinated drinking fluids on Site for personal hydration. Workers should be aware of signs and symptoms of heat-related illnesses, as well as first aid for these conditions. These are summarized in the table below.

Table 4-1. Heat Stress Signs and Symptoms			
Condition	**Signs**	**Symptoms**	**Response**
Heat Rash or Prickly Heat	Red rash on skin.	Intense itching and inflammation.	Increase fluid intake and observe affected worker.
Heat Cramps	Heavy sweating, lack of muscle coordination.	Muscle spasms, and pain in hands, feet, or abdomen.	Increase fluid uptake and rest periods. Closely observe affected worker for more serious symptoms.
Heat Exhaustion	Heavy sweating; pale, cool, moist skin; lack of coordination; fainting.	Weakness, headache, dizziness, nausea.	Remove worker to a cool, shady area. Administer fluids and allow worker to rest until fully recovered. Increase rest periods and closely observe worker for additional signs of heat exhaustion. If symptoms of heat exhaustion recur, treat as above and release worker from the day's activities after he/she has fully recovered.
Heat Stroke	Red, hot, dry skin; disorientation; unconsciousness	Lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse.	Immediately contact emergency medical services by dialing emergency medical services. Remove the victim to a cool, shady location and observe for signs of shock. Attempt to comfort and cool the victim by administering small amounts of cool water (if conscious), loosening clothing, and placing cool compresses at locations where major arteries occur close to the body's surface (neck, underarms, and groin areas). Carefully follow instructions given by emergency medical services until help arrives.

4.3.17 Cold Stress

Workers performing activities during winter and spring months may encounter extremely cold temperatures, as well as conditions of snow and ice, making activities in the field difficult. Adequate cold weather gear, especially head and foot wear, is required under these conditions. Workers should be aware of signs and symptoms of hypothermia and frostbite, as well as first aid for these conditions. These are summarized in the table below.

Table 4-2. Cold Stress Signs and Symptoms			
Condition	**Signs**	**Symptoms**	**Response**
Hypothermia	Confusion, slurred speech, slow movement.	Sleepiness, confusion, warm feeling.	Remove subject to a non-exposed, warm area, such as truck cab; give warm fluids; warm body core; remove outer and wet clothing and wrap torso in blankets with hot water bottle or other heat source. Get medical attention immediately.
Frostbite	Reddish area on skin, frozen skin.	Numbness or lack of feeling on exposed skin.	Place affected extremity in warm, not hot, water, or wrap in warm towels. Get medical attention.
Trench Foot	Swelling and/or blisters of the feet	Tingling/itching sensation; burning; pain in the feet	Remove wet/constrictive clothing and shoes. Gently dry and warm feet with slight elevation. Seek medical attention.

4.3.18 Adverse Weather/Electrical Storms

Field personnel will be responsible for determining if field activities can be continued in a safe manner. High winds, heavy precipitation (rain or snow), electrical storms, and visibility-impairing conditions could make field activities difficult. If the team determines that conditions pose a potential safety hazard, they will advise the PM and/or SSO that further outdoor activities will be terminated until conditions improve. Certain activities can be conducted during moderately inclement weather (e.g., light to moderate rain or snow), but personnel should be alert to an increased likelihood of slip-trip-fall injuries and should limit non-essential activities accordingly, particularly when fall hazards are present (i.e., working at heights in excess of four feet above ground level).

Low visibility conditions can be caused by wind-blown dust, snow, fog, or smoke from fires. During periods of low visibility, driving speeds should be reduced, and when visibility is severely restricted all activities, including driving, shall be suspended until conditions improve except to allow for Site evacuation.

Lightning can be unpredictable and may strike many miles in front of, or behind, a thunderstorm. Workers will therefore cease field operations at the **first** sign of a thunderstorm and suspend activities until at least 30 minutes after the last observed occurrence of lightning or thunder. For purposes of this HASP, signs of a thunderstorm will include any visible lightning or audible thunder. In the event of a thunderstorm, field personnel will take the following actions:

- Get inside a permanent building structure (not a shed or canopy) or fully enclosed metal vehicle (not a convertible or camper shell) with the windows fully up.
- If in a house or building, do not use the telephone or any electrical appliance that's connected to the building's electrical wiring.
- Stay away from tall isolated objects, such as trees, drill rigs, telephone poles, or flag poles.
- Avoid large open areas, such as fields or parking lots, where a person is the relatively highest object.
- Stay away from lakes, ponds, railroad tracks, fences, and other objects that could transmit current from a distant lightning strike.
- If caught out in the open without time to escape or find shelter, seek a low area (if time permits), crouch down, and bend forward holding the ankles. Tuck the head so that it's not the highest part of the body, without letting it touch the ground. Under no circumstances lay down.

If a person struck by lightning contact emergency medical services, even if he/she appears only stunned or otherwise unhurt as medical attention may still be needed. Check for burns, especially at fingers and toes, and areas next to buckles and jewelry.

4.3.19 Sharp Objects/Cutting Utensils

Frequently field tasks require the cutting of items such as rope, packaging or containers. Unprotected, open bladed tools such as pocket knives and box cutters must be avoided and alternative cutting utensils shall be used such as using a hooked blade when cutting open acetate liners or using a self-retracting safety knife. If it is thought that a straight blade knife is necessary, an MOC will need to be approved by the ACR PM prior to use. If use of a straight blade is approved, care should be exercised while performing such cutting tasks. Personnel should cut down and away from their body and other personnel and the item being cut should be braced or secured from movement while cutting.

4.3.20 Elevated Platforms

Work done on an elevated platform or unprotected work area at a height > 6 feet shall be done in accordance with BC HSP 290 Working at Heights Defined Practice and requires the use of a *Working at Heights Permit.*

When working at heights that expose employees to falls greater than 6 feet, especially on sloping roofs and elevated platforms, the requirements of 29 CFR 1926.502 shall be observed. In such instances, a safety harness shall be worn and the lanyard secured at a level not lower than the employee's waist, limiting the free-fall distance to a maximum of 6 feet.

Elevated work platforms shall be constructed, used, and maintained in accordance with Subpart L of the OSHA Construction Safety Orders. Scaffolds and hoisting lines shall be inspected daily by a competent person to verify the integrity of the components. If a material is determined to be defective, it may not be used for any purpose and will be replaced immediately.

A standard railing shall consist of top rail, intermediate rail, toe board, and post. It shall have a vertical height of approximately 42 inches (±3 inches) from the top surface of the top rail to the floor, platform, runway, or ramp. The top rail shall have a smooth surface throughout. The intermediate rail shall be set half way between the top rail and the floor, platform, runway, or ramp.

A cover of standard strength and construction that is secured against accidental displacement shall guard floor holes, hatchways, or any other openings into which a person can walk. When the cover is not in place, the openings shall be guarded with a standard railing (equipped with a toe board) on all exposed sides. Any cover on floor openings shall be properly labeled or stenciled with letters at least one inch high or greater stating 'OPENING – DO NOT REMOVE'.

<u>Personal Fall Protection Equipment</u>
Full body harness is the only acceptable means of fall arrest for personnel working over surfaces greater than six feet in height. A Fall Arrest System consisting of safety harness and anchor lanyard must be worn by anyone working on elevated surfaces that lack 'general' fall protection such as railings, etc.

Lanyards must be tied off at a point above the worker's head and to a firm structure or a portion thereof designed to hold a weight of 5,000 lbs. Only hooks with locking snaps that operate in 'as new' condition will be used. These hooks are also referred to as 'double action lanyard hooks'.

When other possible means of fall protection (railings, etc.) are not available, individuals working at heights of less than 6 feet must tie-off if there is danger of impalement, especially if the impalement hazard cannot be mitigated in accordance with OSHA standards.

All workers must perform routine inspection of belts/harnesses and lanyards prior to their use. The employer shall conduct regular inspections (every three months) of all fall protection equipment. In addition, there shall be an inspection of all workers' personal tools and equipment prior to the employees using them on the job.

Lanyards are to be used for tie-off purposes only, and damaged belts, harnesses, and lanyards must be retired and discarded.

4.3.21 Ladder Use

Ladders are to be maintained in good condition at all times, with tight joints, hardware, and fittings securely attached, and moveable parts freely operating without binding or undo play. Defective ladders must be 'tagged' out of service. Safety 'feet' shall be kept in good condition. Ladders are to be visually inspected for possible signs of damage or defects daily, before each use.

Where possible, portable straight rung ladders shall be set up so that the horizontal distance from the top support to the foot of the ladder is ¼ of the working length of the ladder. The ladder shall be secured by tying it off to a firm point, or held in place by another worker while in use. If the ladder is used to gain access to a roof or platform, the side rails shall extend at least 3 feet beyond the point of support at the edge of the roof or platform.

Step ladders shall always be set up properly, so that they are in the "A" frame position, level and with all four feet on firm ground, and fully opened with the spreaders locked in place. Personnel are forbidden to stand on the top cap or on the last step of a step ladder, or to stand on the hinged back of a step ladder. A step ladder shall never be used at a straight ladder.

4.3.22 Inadequate Lighting

Work activities may require that personnel be present at the Site at times when natural illumination is inadequate. OSHA requires that suitable portable lights must be provided to secure the safety of employees when adequate natural illumination or permanent artificial illumination cannot be made available. Insufficient light causes accidents and reduces work performance. Workers need adequate lighting to see hazards at the work Site and to read information on instruments and dials. Portable outdoor tripod floodlights and/or general purpose work lights will be used at the Site to ensure proper illumination whenever activities are conducted after dark. Where appropriate, work lights should meet the minimum illumination level of 5.0 foot-candles at the point of work.

4.3.23 Traffic

Vehicular traffic presents opportunities for serious injury to persons or property. Traffic may consist of street traffic or motor vehicles operated by facility employees or visitors to the Site. Workers and other pedestrians are clearly at risk during periods of heavy traffic. Risk from motor vehicle operations may be minimized by good operating practices and alertness, and care on the part of workers and pedestrians. Work vehicles will be arranged to be used as a barrier between Site workers and nearby traffic. If required by local ordinances or Site location, a traffic control plan will be developed implemented.

It is important to be conscious of all vehicular traffic that may be present during conduct of field operations. Use caution tape, barricades, or safety cones to denote the boundaries of the work area and to alert vehicle operators to the presence of operations which are non-routine to them. Be careful when exiting the work area and especially when walking out from between parked vehicles to avoid vehicular traffic.

Never turn your Back on Traffic. When working in or near a roadway, walk and work with your face to the oncoming traffic. If you must turn your back to traffic, have a coworker watch oncoming traffic for you.

Vehicle and Worksite Position. Whenever possible, place a vehicle between your worksite and oncoming traffic. Not only is the vehicle a large, visible warning sign, but if an oncoming car should fail to yield or deviate, the parked vehicle, rather than your body, would absorb the first impact of a crash. Turn the wheels so that if the vehicle were struck, it would swing away from the worksite. Even though the vehicle would protect you in a crash, it might be knocked several feet backward. Always leave some room between the rear of the vehicle and the work area.

Use of Signs and Cones to Direct Traffic. Traffic signs and high visibility cones or delineators are used to inform drivers and direct traffic away from and around you. Cones and signs are only effective if they give oncoming drivers enough time to react and make it clear how traffic should react. Cones or delineators should be tall enough to be visible to drivers and should be a minimum 36 inches tall with high-visibility reflective markings.

Cone Positioning. The most common coning situation is setting a taper of cones that creates a visual barrier for oncoming motorists and gradually closes a lane. The position of the taper depends on the road width, position and size of the work area, and also on the characteristics of the traffic.

4.3.24 Driving

A lot of driving is required to get to, from, and between project Sites. Safe vehicle maintenance and operation must be a priority. It requires knowledge of directions to (and conditions of) the Site in advance, careful exiting and merging into traffic, anticipating the unexpected, remaining alert to one's physical and mental condition, resisting distractions such as cell phone use, other car activities and contacting assistance when needed. Observe all posted speed limit signs on the

Site and be aware of changing traffic patterns during Site projects that may involve haul trucks during construction or removal activities. Drivers should not answer or talk on mobile telephones or radios while the vehicle is in motion.

4.3.25 Pit Highwall Stability

Site activities may require field work inside or around the top perimeter of the mine pit. The pit walls have been mined to a pitch steeper than the natural angle of repose which results in unstable walls with the tendency to slough rocks and potentially larger landslides. Working in the pit requires constant attention to the stability of the walls above the work area as well as any benches or roadways you are standing on. When working in an area, visually survey the highwalls above you for the presence of hanging boulders, the existence of fallen rocks in the roadway, and any evidence of loose material such as a constant dribble of small rocks and soil. Also be aware that conditions are typically more unstable when the ground is wet after recent rain or snow events, and in the spring when freeze-thaw cycles can wedge rocks loose. All benches, roadways, and surface edges of the pit should be examined for tension cracks, large arcing cracks in the flat ground surface, that indicate the ground underneath has shifted and is prone to failure. The general work practice should be to minimize the time spent close to the highwall or pit edges to reduce the potential exposure.

4.3.26 Water Hazards

Work done around water that is deep enough to be a potential drowning hazard (i.e. > 3 feet deep or a soft bottom that can cause entrapment) shall be done in accordance with BC HSP 295 Working Around Water Defined Practice.

There are several water hazards on the Site that may, at some time, require the use of a boat to go out onto the water or, more commonly, require personnel to work near the edge of the water while standing on liner material or other unstable surface. There are a number of ponds on Site, both lined and unlined as well as the Pit Lake that are considered water hazards. There may also be off-Site investigation activities that occur near the Walker River. The main hazard of working near these bodies of water is the drowning hazard if a person were to fall in. Additional hazards include exposure to acidic solutions in some of the process ponds (pH of 2 to 5).

As a precaution when working around water hazards, all work should be done with a partner who remains in eye contact at all times. Ponds which are lined with high-density polyethelene ("HDPE") or other synthetic liner can be very slippery, especially when wet, covered with frost, or when the person's footwear is wet or muddy. Personnel should access the water level using an anchored rope or other secured hand and/or foothold, if available, and should wear a floatation vest at all times for added protection.

Activities using a boat for sampling or other access to the middle of a water body, require a two person crew in the boat and a third person on the shore for emergency assistance. All personnel in the boat must wear floatation vests at all times.

4.4 Biological Hazards

The following biological hazards have been identified and may be encountered during scheduled field activities.

- ✓ Bloodborne Pathogens/Sanitary Waste
- ✓ Rodents/Mammals
- ✓ Reptiles/Snakes
- ✓ Venomous Insects
- ✓ Mosquitoes
- ✓ Spiders/Scorpions
- ✓ Ticks

If any biological hazards are identified at the Site, workers in the area will immediately notify the SSO and nearby personnel.

4.4.1 Bloodborne Pathogens/Sanitary Waste

Potential exposure to bloodborne pathogens may occur during some work activities (e.g., sampling or working around the sewage ponds on Site) or rendering first aid or CPR. Direct contact is an important route of exposure for bloodborne pathogens due to puncture injuries, contact with abraded skin, or contact with areas such as the eyes, without appropriate protection. While very few organisms can enter the body through normal intact skin, direct contact with sewage, blood and body fluids is to be avoided. Site personnel should thoroughly wash their hands and face before eating, drinking or smoking and before leaving the work Site.

Exposure controls and Universal Precautions are required at suspect locations, in order to prevent contact with blood or other potentially infectious materials. All blood or other potentially infectious material will be considered infectious regardless of the perceived status of the source individual. A Hepatitis B vaccination should be offered to personnel before the person participates in a task where direct exposure to potentially infectious materials is a possibility (i.e., first aid or CPR). For personnel who have potential exposure to sanitary wastes, a current tetanus/diphtheria inoculation or booster is recommended.

4.4.2 Rodents/Mammals

Animals may potentially carry the rabies virus or disease causing agents. Do not attempt to feed or touch animals. Feces from some small mammals may contain diseases such as Hanta Virus. Avoid generating dust in the vicinity of rodent feces. In addition, animals such as dogs or wild predators (i.e., cougars or coyotes) may pose an attack hazard. Persons should slowly back away in a non-threatening manner if an encounter with a threatening animal occurs. In order to avoid such encounters, use the buddy system and make noise when working in areas where such animals may be present.

4.4.3 Reptiles/Snakes

The primary reptiles of concern are venomous snakes (e.g. rattlesnake). Avoid contact and areas that may harbor snake populations including high grass, shrubs, and crevices. In the event of a bite, immobilize the affected area and contact emergency medical services. If more than 30 minutes from emergency care, apply bandage wrap two to four inches above the bite (Note: bandage should be loose enough to slip your finger underneath).

4.4.4 Venomous Insects

Common examples include bees, fire ants and wasps. Avoid contact with insects and their hives. If stung, remove the stinger by gently scraping it out of the skin (do not use tweezers). If the worker is stung by an insect, immediately apply an ice pack to the affected area and wash area with soap and water and apply antiseptic. If an allergic reaction occurs, contact emergency medical services for appropriate treatment.

4.4.5 Mosquitoes

Mosquitoes may transmit diseases such as West Nile Virus. Symptoms of West Nile Virus include: fever, headache, tiredness, body aches, and occasional rash. Apply insect repellent to clothes and/or skin (if FDA approved for topical use). Mosquitoes are most active from dusk to dawn.

4.4.6 Spiders/Scorpions

The black widow and brown recluse spiders are the most venomous. Avoid contact with spiders and scorpions and areas where they may hide, particularly shaded and protected locations. Inspect clothing and shoes before getting dressed and wear gloves when working with lumber, rocks, inspecting buildings, etc. The black widow is known to occur at the Site while the brown recluse is not typically found in this area, as their habitat is the warmer climate of the southern states. Signs and symptoms of bites include: headache, cramping pain/muscle rigidity, rash and/or itching, nausea, dizziness, vomiting, weakness or paralysis, and convulsions or shock. Wash bite area with soap and water and apply antibiotic cream. Contact emergency medical services if allergic reaction or severe symptoms occur.

4.4.7 Ticks

Deer ticks may carry and transmit Lyme disease to humans. Signs of Lyme disease include a reddish 'bulls-eye' around the affected area approximately a week after the bite. Symptoms include headache, fever, and muscle/joint pain. Persons suspecting infection should contact a health professional. Whenever possible avoid areas likely to be infested with ticks during the spring and summer months.

Deer ticks may occur at the Site but are not expected to be common at the Site because of limited wildlife and vegetation. During the spring when ticks are most likely to occur at the Site, wear light-colored clothing so ticks can be easily spotted and removed and pants tucked into boots or socks. Apply insect repellents to clothing and skin. Persons with long hair should tie their hair back to minimize the potential for ticks to nestle in the scalp.

Personnel should self perform tick checks once daily field work is completed. If a tick is embedded in the skin, use tweezers to grasp the tick's head (near the skin) and pull straight out. Consider saving the removed tick for laboratory analysis.

SECTION 5.0
RADIOLOGICAL PROTECTION

Radioisotopes have been found to occur in the soils, tailings and sediments in localized areas at the Yerington Mine. These radioisotopes originated from naturally occurring radioactive materials (NORM) in the ores and soils that were mined for their copper content. The processing of these ores has resulted in the concentration of some radioisotopes in the tailings and waste streams. When this occurs, the concentrated radioisotopes are termed technologically enhanced naturally occurring radioactive materials (TENORM). TENORM radiological materials have also been identified in occurrences of pipe scale and sediment found in select sections of transite (asbestos cement) piping found in the Process Areas and pipe laydown yards.

Exposure to potential radiological hazards will be mitigated by the use of engineering controls, administrative controls, or PPE to prevent exposures where possible, or minimize them where engineering controls are not feasible.

5.1 Radiological Control Area Definition

The use of Radiological Control Areas ("RCA") will be implemented in order to restrict access to areas that have been determined to have potential radiological hazards based on allowable OSHA exposure limits. An RCA is defined as any area on the Yerington Mine Site that exceeds 0.2 mrem/hr external dose exposure level at a height of one meter, or approximately waist height, as measured by a tissue-equivalent survey meter. The RCA action level is based on the Site specific allowable worker exposure level originally established in the *Radiological and Chemical Exposure Control Plan* (RMEC 2004) of 500 mrem/year, and summarized in Table 5-1.

Table 5-1. Annual Radiation Exposure Control Levels

Personnel Class	Type of Exposure	Annual Limit [a]
Routine Site Worker	Whole Body (internal, external)	500 mrem [b]
Declared Pregnant Worker	Embryo/Fetus	500 mrem per gestation period
Visitors [c] and Public	Whole Body (internal, external)	100 mrem

[a] Exposures due to background radiation, therapeutic and diagnostic medical procedures, and voluntary participation in medical research programs shall not be included in either personnel radiation dose records or assessment of dose against the limits in this table.

[b] The legally enforceable annual Occupational Safety and Health Administration Exposure Limit for radiation is 5,000 mrem (5 Rem). However, in accordance with prudent practice, radiation exposure levels should be kept as low as reasonably achievable ("ALARA"). Therefore, ARC has established a goal of maintaining annual radiation exposure levels below 500 mrem for Site workers. This ALARA goal will be reevaluated as exposure data becomes available.

[c] Applies to visitors who have not completed training in accordance with applicable Site Health and Safety Plans. This dose limit applies specifically to doses received by personnel while on the Yerington Mine Site. It was derived from recommendations from the International Commission on Radiological Protection ("ICRP").

This annual limit of 500 mrem/year was established by ARC as the as-low-as-reasonably-achievable ("ALARA") goal, and is based on limiting potential worker exposure to no more than ten percent of the legally enforceable OSHA PEL of 5,000 mrem/year (5 rem/year or 1 ¼ rem/quarter). A constant external exposure of 0.2 mrem/hr over a standard 2,000-hour work year would result in a cumulative external exposure level of 400 mrem/year, 80 percent of the established ALARA goal. This is conservative based on the assumption that up to 100 mrem/year may occur as internal exposure.

Surveys to delineate RCAs will begin with measuring the external radiation dose levels in the work area with a tissue-equivalent survey meter that will provide dose rates in mrem/hour or µrem/hour. The external dose rates in a work area will serve as the primary criteria for determining which locations at the Yerington Mine will be treated as Radiological Control Areas. Since the vast majority of the radioisotopes identified at the Yerington Mine are gamma emitters, the criteria for external screening will also detect the presence of source materials that may contribute to internal radiological dose via worker inhalation or ingestion.

If Radiological Control Areas are identified, the boundary of these areas will be demarcated with caution tape and warning signs. Workers should avoid entering established Radiological Control Areas unless specific Site investigation or maintenance tasks are required in those areas. Additional radiological monitoring, specific personal protective equipment (PPE) requirements and specific contaminant control procedures will be required for workers that perform tasks in the Radiological Control Areas. Characteristics of the RCA, and appropriate control actions, are summarized in Table 5-2.

Table 5-2. Radiological Control Area Characteristics

Area Type	Survey Type and Equipment	Action Level [a]	Control Actions
Non-Hazard Area	External Radiation Survey with a Tissue Equivalent Meter	< 0.2 mrem/hr (<200 uR/hr)	▪ Standard work clothing and precautions prescribed in Site-specific safety and health plan. No additional radiation precautions are necessary.
Radiological Control Area	External Radiation Survey with a Tissue Equivalent Meter	> 0.2 mrem/hr (>200 uR/hr)	▪ Mark area with warning tape and radiation signs. ▪ Use latex gloves, disposable booties and coveralls. ▪ Use ½ face respirator with P-100 cartridges. ▪ Entrants wear thermo-luminescent dosimeters. ▪ Survey personnel and equipment leaving the area. Decontaminate as necessary. ▪ Initiate personal and area air monitoring to determine internal dose.

[a] Measured at one meter above ground level (approximately waist height) based on OSHA PEL whole body exposure limit, which is measured at the torso.

5.2 Radiological Exposure Prevention: ALARA Principles

Radiation exposure of project personnel will be controlled such that radiation exposures are well below regulatory limits. Unplanned and preventable exposures are considered unacceptable. All project tasks will be evaluated with the goal of eliminating or minimizing exposures. All project personnel have the responsibility for following ALARA principles and practices. Personnel working at the Site must strive to keep both external and internal radiation doses ALARA by adopting the practices outlined below.

Basic protective measures used to reduce external doses include: 1) minimizing time in radiation areas, 2) maximizing the distance from known sources of radiation, and 3) using shielding whenever possible. These methods of minimizing external dose are described below.

Methods for Minimizing Time

- Plan and discuss the tasks before entering a radiation area (including having all equipment and tools prepared).
- Perform as much work as possible outside radiation areas and take advantage of lower dose rate areas (as shown on the radiological survey maps).
- Take the most direct route to the tasks and work efficiently.
- If problems (such as engineering control failures, equipment or machinery malfunctions, personal injury or unexpected radiation exposure) occur in the radiation areas, hold technical discussions outside radiation areas, then return to the work area (if practical as determined by the SSO or the Site health physicist) to complete the task.

Methods for Maximizing Distance from Sources of Radiation.

- Use remote operated equipment or controls where required.
- Stay as far away from the source of radiation as possible (extremely important for point sources where, in general, if the distance from the source is doubled, the dose rate falls to one-fourth of the original dose rate).
- Become familiar with the radiological survey map for the area in which work will be performed as well as high and low dose-rate locations, and take advantage of low dose-rate areas.

Methods for Utilizing Shielding

- Place polycarbonate (Lucite, plexiglass, or similar) sheets between personnel and the radiation source to reduce exposure to beta radiation.
- To shield gamma radiation, place lead sheets or bricks placed between the radiation source and personnel.
- Gamma radiation may also be shielded by the use of concrete panels or barriers and water-filled traffic control barriers. Areal gamma radiation sources can also be shielded by covering them with a layer of soil, gravel, or similar material. Increased shielding can be obtained by increasing the cover layer thickness until sufficient shielding is obtained.

5.3 Monitoring Methods

Various radiation monitoring methods shall be used depending on the potential exposure route and the goal of the monitoring data. Monitoring will be used to identify hazard areas (radiological control areas), determine worker external and internal exposure levels, identify waste materials that require special handling as radiological wastes, and determine surface contamination of personnel, equipment, and clothing. Table 5-3 describes the basic types of radiological monitoring that will be performed as appropriate to ensure radiological exposures are properly assessed and controlled during Site activities.

Table 5-3. Methods for Radiological Monitoring

Type of Monitoring	Method of Monitoring	Purpose
External Radiation Exposure	Tissue equivalent survey meter	Identify RCA location and boundary; test to confirm an area is not a radiation hazard before commencing work
External Radiation Dose (personnel)	Personnel TLD/OSL	Monitor cumulative external exposure for Site workers who spend significant amounts of time on Site or who work in RCAs
Internal Radiation Dose	Bioassay sample analysis (urine or fecal)	Test for occurrence of internal exposure for suspected exposed workers
Personnel Contamination Survey's	Survey meter (frisker)	Test workers exiting from an RCA for external contamination
Radiological Surface Contamination	Survey meter (frisker), tape press, large area wipes, smears	Test heavy equipment, field meters or other field supplies exiting from an RCA for external removable contamination
Airborne -Radioactivity	Representative personnel sample	Test the breathing zone of an individual Site worker for a defined work period
Airborne Radioactivity	High volume area air sample	Test for radiological material in airborne dust around the perimeter of a work area to determine potential off-Site migration
Airborne Radon Concentration	High volume area air sample using Kusnitz or equivalent method	Test for the presence of radon gas in enclosed work areas where radon gas may be present
Transite Pipe External Gamma Count Rate	NaI detector or tissue equivalent survey meter	Scan transite pipe waste during removal action to determine disposal requirement

5.4 External Radiation Monitoring for Personnel

All personnel who will be working for at least 30 working days within any 90-day period at the Yerington Mine Site shall be required to wear a personal monitoring device during all working hours on the Site. Additionally, any person, including visitors, who enters a predetermined radiation area whose access is controlled or who is likely to receive greater than 10% of a permissible limit, shall wear appropriate devices for measuring personnel beta/gamma radiation

exposure. According to the Nuclear Regulatory Commission (10 CFR 20.1502), if an adult is likely to receive in one year a dose greater than 10 percent of any applicable limit, monitoring is required (NRC, 1992).

Personnel Monitoring Devices. Personnel monitoring devices worn will normally be thermoluminescent dosimeters ("TLD") or optically stimulated luminescent dosimeters ("OSL"). These devices are used to record external radiation dose to occupationally exposed workers and visitors at the Site. The use of calibrated pocket ionization chambers or electronic dosimeters are permissible only for supplemental dosimetry for normal work activity or for visitors or brief work activities.

The type of personnel monitoring device being used by workers at the Yerington Mine Site is a type "P" optically stimulated luminescent dosimeter, manufactured by Landauer, Inc., called the Luxel+. These dosimeters measure as low as 1.0 mrem with a precision of +/- 2 mrem. They measure gamma, beta and neutron radiation. According to Landauer, the Luxel+ dosimeter is unaffected by heat, moisture, and pressure as long as the outer plastic protection is not damaged. A description of the dosimeter, including technical specifications, is provided in Appendix E.

Use and Storage of Dosimeters. Dosimeters shall be issued to workers based on their potential exposure as related to the area(s) where they will be working and the amount of time they will spend on. In determining the likelihood of potential exposures, the use of professional judgment is necessary. This judgment should include consideration of the following:

- Areas in which the individual will work;
- The individual's previous occupational dose during the current year;
- Documentation of actual radiological conditions in the areas to be entered; and
- Potential for changes that may affect the radiological conditions.

For uniform exposures, a measurement taken in the torso region is sufficient (Department of Energy "DOE", 1999). For the Yerington Mine project, all dosimeters shall be worn on the front of the body between the neck and the waist. Each field worker shall keep the dosimeter clean and free of soil or dust, by wiping any such dirt off with a clean paper towel.

The designated location for storage of the dosimeters is on the dosimeter badge rack with the control dosimeter(s) located inside the Brown and Caldwell field office in Weed Heights. The areas where the badges are stored shall remain locked during non-working hours to prevent unauthorized entrance and tampering. Dosimeters shall be retrieved at the start of each work shift and returned to their storage location at the end of the work shift by each individual. All dosimeters are permanently labeled with the individual's name, protected by a plastic enclosure. Each individual shall carefully check for their name before removing the dosimeter from the rack.

Dosimeter Collection, Processing, and Analysis. The frequency of collecting and processing personnel dosimeters depends on the measurement method and associated lower limit of detection. According to the DOE, the collection/processing frequency should be chosen so that it

is unlikely that an individual will receive a dose equivalent equal to or greater than the values listed in 10 CFR 835.402(a) from external radiation without detection and quantification (DOE, 1999). For the Luxel+ dosimeters, the exchange frequency recommended by Landauer is either monthly, bi-monthly, or quarterly.

When dosimeters are exchanged at the end if the determined monitoring period, the 'expired' dosimeters are packaged with the accompanying 'control' dosimeter and shipped back to the laboratory in accordance with laboratory protocol. The expired dosimeters must be returned to the laboratory within 60 days from the date they are taken out of service. The date that the dosimeter is taken out of service is noted on each device or on accompanying paperwork. Management of dosimeter badges will be controlled by the Site Safety Officer who will distribute new badges when received and collect old badges for shipment to the lab for analysis. If a worker loses a dosimeter, they should report it to the SSO immediately and request another dosimeter. Records of the lost dosimeter will be maintained.

Laboratories that process and analyze dosimeters used in Nevada must be certified by the National Voluntary Laboratory Accreditation Program ("NVLAP"). The Landauer, Inc. laboratory which is receiving and processing the dosimeters used at the Yerington Mine Site is NVLAP-certified.

Dose Evaluation. For the Yerington Mine Site, it is expected that field workers, if exposed, would be exposed to a uniform radiation field, thus measurements will be collected in the torso region, and the effective dose equivalent will be based on using a single whole body dosimeter. This method is adequate for uniform or nearly uniform fields (DOE, 1999), the only potential exposure type expected at the Site.

Records shall be maintained to document the doses received by all individuals monitored and to document doses received as a result of planned special exposures. The following quantities shall be reported from the laboratory and recorded for external dose received:

- Effective deep dose equivalent from external sources;
- Lens of the eye dose equivalent; and
- Shallow dose equivalent to the skin.

Exposure to the extremities and skin from external radiation shall be evaluated using the shallow dose equivalent as evaluated at a tissue depth of 0.007 cm (7 mg/cm2) (10 CFR 835.2(b), Shallow dose equivalent). The dose equivalent limit for exposure for the project Site shall be based on that for occupational general employees, and is 10% of the most conservative value for dose equivalents (total dose equivalent of 5 rem per year), resulting in a dose equivalent of 0.5 rem (500 mrem). Any worker receiving a dose equivalent equal to or greater than 500 mrem over a one-year period shall discontinue field work until the source of exposure can be identified and the worker can be evaluated.

Recording and Documentation. Records shall be maintained to document the doses received by all individuals monitored and to document doses received as a result of planned special exposures. Personnel monitoring records shall be maintained by the employer. Annual radiation exposure reports will be provided to each individual employee. Additionally, any individual may review their dosimetry record at anytime.

5.5 Internal Radiation Monitoring for Personnel

Protection of personnel from internal radiation exposure, whether via inhalation or ingestion, shall be provided by means of proper hygiene to limit ingestion intakes, and control of inhalation of airborne radiochemicals. Control of ingestion intakes shall be maintained by implementation of proper personal hygiene. With areas designated to be RCAs, there shall be no eating, drinking, or chewing of gum or tobacco. Upon exiting the RCAs, personnel shall wash their hands (and face if respiratory protection is not worn) prior to doing any of these actions. Control of inhalation shall be maintained by minimizing work in dusty environments where radiochemicals are known to be present (i.e., RCAs) and by the use of respiratory protection or air monitoring as described below and in Section 7.0.

5.5.1 Integrated Personal Monitoring

Integrated personal air samples will be collected from workers' breathing zones using personal sampling pumps on the Site to determine airborne concentrations of radioisotopes during various sampling and investigation operations that have the potential to generate airborne dust. Alternatively, respiratory protection may be required in lieu of air monitoring. The air sample filters will be analyzed for radioisotopes by an NVLAP-accredited laboratory and these sampling results will be compared to the derived air concentration ("DAC") limits for those isotopes to determine the internal committed effective dose equivalent ("CEDE") and the adequacy of dust control methods. Since the radioisotopes in the air sample may not be in equilibrium, the sum of the fractions of the multiple radioisotopes will be calculated using a unity analysis for comparison with the corresponding DAC value. If gross alpha/beta analysis is used, the most restrictive radiochemical DAC shall be used unless information is available to apportion the total activity among the radiochemicals present.

The initial frequency of airborne particulate radiation monitoring is summarized in Table 5-4. This frequency may be modified by the health physicist as exposure data becomes available.

Table 5-4: Airborne Particulate Radioactivity Monitoring/Sampling Frequency	
Frequency[a]	**Location of Condition**
At the beginning of intrusive work	In work areas where survey measurements indicate dose rates > 0.2 mrem/hour above background.
At the beginning of work	On a job or task which is likely to produce airborne radioactivity in excess of 10% of the DAC.
During tasks	Which are likely to produce airborne radioactivity in excess of 10% of the DAC.
Continuously	During entry into airborne contamination areas > 10% but < 100% of the applicable DAC, sample the person(s) most likely to be exposed to source of airborne contamination. Consideration should be given to monitoring all individuals who enter the area.
Continuously	During entry into posted airborne contamination areas ≥ 100% of the applicable DAC, sample all individuals who enter the area.

[a] Monitoring airborne radioactive contamination shall be conducted in situations where airborne radioactivity levels can fluctuate and early detection of airborne radioactivity could prevent or minimize inhalation of radioactivity by personnel. If respiratory protection is used, the actions levels may be modified by the respiratory protection factor afforded by the respirator being used.

5.5.2 Radon Monitoring

No specific air monitoring for radon will be performed during the initial sampling efforts at the Yerington Mine.

5.5.3 Bioassays/Whole Body Counts

The Site monitoring plan has been designed to identify areas and tasks at the Site that have the potential for generating particulate and gaseous airborne radioisotopes at concentrations above 10% of the DAC for the identified radioisotopes. Workers performing tasks in these areas where particulate radioisotopes are found at above 10% of the DAC will be required to wear respiratory protection to minimize the inhalation uptake and internal exposure to these radioisotopes. As a contingency to ensure significant internal exposures have not occurred, whole body counts and/or urine bioassays for radiochemicals may be performed on selected workers. The Site SSO or Site Health Physicist will determine if whole body counts and/or bioassays are required for any Site workers.

5.6 Contamination Control Monitoring for Personnel and Equipment

Personnel and equipment that have entered Radiological Control Areas or handled radiological waste will be monitored for surface contamination (frisked) prior to leaving the controlled area. The Site health physicist will use a GM survey meter with a frisker probe (Ludlum Model 14C with Model 44-9 probe or equivalent) to frisk the surfaces of all equipment and personnel leaving the Radiological Control Area for radiological surface contamination. All accessible surfaces of equipment must measure below 100 counts per minute (CPM) above background for

unrestricted release from the Radiological Control Area. If surfaces show radioactivity of greater than 100 CPM above background, they will be cleaned until the prescribed level of radioactivity is achieved. If tools or equipment cannot be cleaned to an acceptable level, they must remain on Site until free and/or restricted release criteria for fixed contamination has been developed.

Personnel leaving the Radiological Control Area will remove all disposable PPE, place the PPE in plastic bags and enter a radiological buffer area at the boundary of the control area. All personnel will then be frisked to ensure they are not contaminated at a level 100 CPM above background. Soap and tepid water will be used to remove contamination from the skin of personnel contaminated above this level. If the contamination is found on the clothing of a worker, the contaminated clothing will be removed and left on Site with the other disposable clothing. Workers required to leave contaminated clothing on Site will be provided with temporary, alternative clothing.

Contaminated disposable PPE, clothing and materials used to clean contaminated equipment will be double bagged, placed in 55-gallon drums and left on the Site in a buffer area at the boundary of the Radiological Control Area until a final determination of the disposal methods for the materials has been made.

SECTION 6.0

PERSONAL PROTECTIVE EQUIPMENT AND CONTROLS

This section identifies the appropriate PPE, engineering and administrative control measures, and monitoring/sampling procedures to be employed at the Site to limit the risk of exposure to potential hazards. As additional information becomes available identifying new or previously unknown Site or task-specific hazards requiring variations or modifications to these requirements or additional PPE/controls, the HASP will be modified accordingly.

6.1 Personal Protective Equipment

The purpose of personal protective clothing and equipment is to shield or isolate individuals from the chemical, physical, radiological, and safety hazards that may be encountered during project tasks when engineering and other controls are not feasible or cannot provide adequate protection. It is important to realize that no one PPE ensemble can protect against all hazards under all conditions and that proper work practices and adequate training will serve to augment PPE to provide the greatest level of protection to workers.

The minimum required level of PPE for work at the Site is EPA Level D. If conditions exist that would require a level of protection higher than Level D (i.e., Level C, B, or A), work shall be interrupted and workers will dress in the appropriate higher Level C or leave the work area until conditions return to those appropriate for Level D, at the discretion of the SSO.

The PPE required for each job task will be identified in the job work risk assessment and the TSEA.

Level D – Minimum Required. The PPE policy at the Site requires that field workers wear, at a minimum, the following PPE:

- Sturdy leather or rubber steel-toed boots;
- Safety glasses with side shields;
- Hard hat (SSEs will wear orange hard hats);
- High visibility clothing such as orange shirt or reflective vest; and
- Long-sleeved shirt.

Additional PPE that may be added include, but are not limited to:

- Gloves (leather, nitrile, latex or other as appropriate);
- Goggles and/or face shield for splash protection;
- Tyvek coveralls;

- Ear plugs; or
- Floatation vest.

The Site Safety Officer will determine where and when additional PPE will be required for each project. Selection of the proper PPE is based on the following considerations:

- Specific conditions and nature of the tasks;
- Potential contaminant routes of entry;
- Physical form and chemical characteristics of hazardous materials, chemicals, or waste;
- Toxicity of hazardous materials, chemicals, or waste that may be encountered;
- Duration and intensity of exposure; and
- Compatibility of chemical(s) with PPE materials and potential for degradation.

Level C. EPA Level C is used when airborne concentrations are at levels that pose a potential inhalation hazard but are low enough that an air-purifying respirator ("APR") provides sufficient protection. Level C PPE will include all of the above Level D PPE plus half or full-face APR with combination P-100 particulate filter and/or organic vapor/acid gas cartridge or other suitable cartridge based on known air contaminants. This level of protection is the minimum required when airborne concentrations exceed PELs. Tasks that could potentially require respiratory protection include removal or handling of contaminated soil that has been dried to the point that airborne particulates are generated. Issuance, fitting, and testing of respirators shall be conducted in accordance with a respiratory protection plan.

Levels A and B. Level A and B require the use of self-contained air supplies and Level A requires the use of a fully encapsulating protective suite. There are no provisions to upgrade to Level A or B during this project.

6.2 Safety Supplies

Additional safety supplies may be required as follows:

First Aid Kit. A first aid kit should be available at all times in the area of field activity. This is best accomplished by keeping a kit in all field vehicles. Additional first aid supplies or medicines may be kept in the field office.

Eye Wash. An eye wash solution will be available in first aid kits in all on Site vehicles. A personal decontamination shower will be available in Lab Building, located on the south side of Burch Drive. A portable water tank with attached hose will be required at the field location during hazardous activities with the possibility of splash or contact with acidic solutions or sludges.

Fire Extinguisher. Extinguishers will be maintained in all field vehicles as well as all field office and storage areas. Extinguishers shall be inspected monthly to ensure they are full and in working condition.

Ear Plugs. Disposable foam ear plugs will be stocked and made available for all activities that create a noise hazard.

Floatation Vests. Any activities that require working from a boat in open water require the use of personal floatation devices for each person aboard the boat.

6.3 Engineering and Administrative Control Measures

The field team and subcontractor personnel will be reminded during safety briefings to be aware of potential chemical and physical hazards and to immediately inform the other on-Site personnel of any unsafe conditions or new hazards they may encounter. Each field team is responsible for ensuring that Site control measures are implemented (e.g., marking, warning signs, placards, erecting barriers, securing, and controlling access) and informing Site personnel of specific work Site hazards.

Lock-Out/Tag-Out Procedures. As the name implies, lock-out/tag-out employs a device such as a tag, lock, or fastener to prevent startup or energizing of powered equipment and other machinery that could move or result in releases of substances (corrosive liquids, vapors, etc.) that would put field personnel in danger. To prevent any unexpected startup or energizing, a lock is secured to the equipment/machinery power source in a manner that prevents activation of the equipment during servicing, maintenance, or troubleshooting activities. A description of the lock-out/tag-out procedures is provided in Section 4.3.12.

Chemical/Flammable Storage. All flammable materials will be stored in a chemical storage cabinet located in a secured area of the Site accessible only to authorized personnel. The cabinets will have sufficient spill containment and appropriate Department of Transportation ("DOT"), National Fire Protection Association ("NFPA") or Hazardous Materials Identification System ("HMIS") rating system placards or signs. All containers will be regularly checked for leaks, and must be clearly labeled, tagged, marked (e.g., signs, labels, DOT/HMIS/NFPA placards, etc.) indicating the name/type of hazardous chemical(s) and the health and safety ("H&S") hazards. MSDSs for hazardous materials used or stored at the Site will be maintained in the field office.

Dust Suppression. Care will be taken to control dust around the work Sites to minimize worker exposure as well as limit potential off-Site migration. Depending on weather conditions and project requirements, dust control may be administered to locations prior to commencing work, either at the beginning of the day or before work starts at a new sample location mid-day. Dust control will be applied immediately to the soil surrounding the work area, and dust particulate monitoring will continue in accordance with this HASP. Should the area dry out and dust levels increase, dust control measures will be reapplied or the area.

Dust control will consist of tap water sprayed from a truck-mounted portable plastic tank or from a water truck. To avoid possible compromise of analyses, water will not be sprayed directly on the area where the borehole will be drilled, or where a surface sample will be collected.

Buddy System. The 'buddy system' ensures that each field team member will have the assistance of a partner who will be able to observe symptoms of chemical exposure, illness, secure emergency assistance, and provide direct assistance whenever necessary. The 'buddy system' will be in effect during all non-routine or potentially hazardous activities. However, many routine procedures can be safely handled by one person. Routine activities include observation, adjustment of valves or controls, sample collection, and maintenance activities that do not require electrical power tools, ladders, or the potential release of any substance. For these routine activities the required use of the 'buddy system' can be waived. Non-routine operations, such as major equipment repair or maintenance activities, working near excavations, working near water and mitigation of any material release or line-breaks, will require the presence of two people at the work Site.

SECTION 7.0
AIR MONITORING AND RESPIRATORY PROTECTION

Airborne dust or vapors may be generated during field activities such as drilling and excavation. Concentrations of contaminants in that dust or vapor may be at levels that are hazardous to the health of nearby workers. The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection, engineering controls, and work practices. If identified air contaminants cannot be reduced to acceptable exposure levels, the appropriate level of respiratory protection must be identified and workers must be trained and evaluated for participation in a respiratory protection program.

7.1 Air Monitoring

Initial screening for identification is often qualitative, but the determination of its concentration must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants: a) on-Site direct-reading ('real time') monitoring instruments and b) laboratory analysis of air samples obtained by gas sampling bags, collection media, or wet-scrubber collection methods.

Preferably, air monitoring will be accomplished with direct-reading real time instruments to provide the quickest notification to workers of exposure levels. The types of direct-reading air monitoring instruments that may be used include:

- Gas Detector Tubes (e.g. Draeger)
- Multi-Gas Detector
- Particulate Monitor (e.g. MIE Miniram PDM-3)
- Volatile Organic Monitor (e.g. Photo-ionization detector ["PID"] or flame-ionization detector ["FID"])

The following tools may be used to obtain a more accurate measurement of dust or contaminant concentrations but require the collection of a sample over time, typically an 8 hour work shift, which is then submitted to a laboratory for analysis.

- Personal air pump samplers with filter collection
- PM_{10} and $PM_{2.5}$ Samplers

It is essential that each piece of monitoring equipment be calibrated on a routine basis. This assures that a given monitoring instrument is both operational and working with reasonable degree of accuracy this procedure outlines required calibration frequencies and techniques. The manufacturers' instruction manual should always be available for specific calibration procedures

and other information. It is also important that each piece of monitoring equipment be checked occasionally during its use to determine that it is responding to contaminants. These 'response checks' are key to providing confidence to the user that the instrument is at least functioning and responding to contaminants.

Site-specific action levels and air monitoring requirements shall be presented in individual Project HSSE Plans.

7.2 Respiratory Protection

This program is intended to inform employees about the proper selection, use, limitations and maintenance of respirators should respiratory protection be required. Employees voluntarily using disposable dust masks are not subject to this Respirator Program. Disposable dust masks will not be used to protect against exposures potentially over the PEL. Their use is only intended for use around very low concentrations of nuisance dust.

Good respiratory protection depends on identifying the potential airborne hazards and their approximate concentrations to be suitable for the purpose intended. A breathing hazard exists when an air contaminant is inhaled at high enough concentrations to cause harm. Depending on the agent, damage might occur immediately or it may take years to show up. An immediate breathing hazard also exists when the air does not contain enough oxygen to support life. There are two basic levels of hazard.

Immediately Dangerous to Life and Health ("IDLH"). An atmosphere is considered IDLH when a person cannot escape unprotected in a few minutes without suffering fatal or serious injury. IDLH conditions include:

- Oxygen Deficiency (less than 19.5 percent oxygen). This can be produced by nitrogen or other gases displacing oxygen, by fires or burning processes, or even by rusting in metal-lined spaces.
- High levels of toxic gases or particulates (e.g., more than 300 parts per million of carbon monoxide).
- When exposure and contamination information cannot be estimated from Site history or mass loading calculations. In this event maximum potential exposures will be assumed, monitored, and protected against accordingly.

Flammable gases and vapors exceeding IDLH levels may also present fire and explosion hazards if concentrations approach the Lower Explosive Limit ("LEL"). The LEL is measured as a percent-in-air concentration (by volume) and is different for each flammable gas or vapor. If flammability is a potential risk of a job, gas or vapor levels must be monitored and/or adequate precautions must be taken for levels at or above 20 percent of the LEL (10% or lower in confined spaces as specified in the entry permit). Oxygen enrichment (more than 23.5 percent oxygen) can also contribute to increased fire hazard.

It is not expected, and there are no provisions, for employees to be required to work in IDLH atmospheres for this project. Should an IDLH atmosphere be identified, all work activities will cease until the concentrations in the atmosphere are reduced below IDLH levels.

Not Immediately Dangerous to Life and Health. When air contaminants are below IDLH levels, they can still cause varied health effects ranging from irritation and discomfort to serious illness. Air contaminated with solvent vapors or dust from solid chemical compounds falls into this second category; these agents can produce acute health effects but also over time may cause irreversible chronic damage. There are two general types of contaminants based on their chemical and physical properties: 1) particulates, and 2) gases and vapors. Employees shall not be exposed above a PEL without controls being used to reduce exposure. Engineering or work practices that minimize or eliminate the exposure are required except when they are not feasible, are being developed or during an emergency. In those case, respiratory protection must be used.

7.2.1 Respirator Types, Selection and Use

Respirators are to be used as protective measures only when engineering or administrative controls are unfeasible or in emergency situations with high exposures. The protection given by a respirator is only as good as the correct identification of hazards, the match between its intended and actual use factors affecting its performance, the condition in which it is maintained, and the fitting/sealing of the respirator to the user's face.

Respiratory protective devices fall into two classes: air-purifying and air-supplying. Air-supplied respirators include airline and self-contained breathing apparatus ("SCBA"). Selection of a respirator is dependent on the degree of protection offered by various types. The protection provided by a respirator can be measured as its protection factor according to the following ratio:

Protection Factor = Concentration Outside the Respirator / Concentration Inside the Respirator

The following important precautions for respirator selection must be heeded:

- Only NIOSH-approved respirators shall be selected for use.
- Hazard levels must be determined prior to use of respirators, e.g., the approximate air contaminant(s) levels and oxygen concentration.
- Physical characteristics or individual needs which may limit safe use or require special procedures must be identified.
- Eye Irritation – A full-face, hood or helmet respirator must be used against any air contaminants in concentrations which are highly irritating to the eyes (i.e., ammonia).
- Skin Exposure – Certain air contaminants can harm the body by degrading skin or being absorbed.
- Protection Factor or Maximum Use Concentration Exceeded - Respirators shall not be used where air contaminant levels exceed the protective level of the mask (its protection factor times the air contaminant's Permissible Exposure Limit).

- Poor Facepiece Seal – The facepiece seal may be broken by glasses, earmuffs, beards, and hair. Employees must be clean-shaven where a tight fitting facepiece contacts the skin.

Employees must leave the respirator use area if the following conditions occur:

- If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece;
- To wash their faces and respirator facepiece as necessary to prevent eye and skin irritation associated with respirator use; and
- To replace the respirator or the filter, cartridge or canister element.

Air Purifying Respirators

Air-Purifying Respirators remove contaminants from inhaled air. They can only be used in atmospheres containing sufficient oxygen (>19.5% by volume) and below specified air concentrations. The suitability and useful life of an air-purifying respirator depends on the type and concentration of contaminants, the breathing rate and volume of the wearer, and the capacity of the air-purifying medium (i.e., filter or charcoal).

How They Work. Air purifying respirators work by filtering or adsorbing contaminants form the air. These air purifying elements are contained in 'cartridges'. For each exposure, the cartridge equipped with the proper air purifying element must be used.

Chemical Cartridges. Chemical Cartridges protect by adsorbing low concentrations of certain gases or vapors by utilizing various types of untreated and/or treated charcoal to purify the inhaled air. For example, charcoal grains 'soak up' the gas or vapor much like a sponge. Chemical cartridge respirators are non-emergency devices and shall never be used for entry into unknown or IDLH atmospheres. Chemical cartridges do not offer protection against particulates. The cartridges should be changed whenever the end of service life is met as determined by the exposure factors for each job task, based on the job exposure evaluation. Chemical cartridges should be changed at the end of the shift they are worn or if it is suspected the cartridge(s) have become ineffective, whichever is sooner.

Filters. Filters remove solid and liquid particulates by the mechanical action of a sieve that is too small to let particles through but allows gases and vapors to pass. A particulate filter will trap very small toxic particulates such as heavy metals, welding fumes and asbestos. It is recommended that workers use P 100 filters for this project as their application includes a wide variation of potential exposure conditions.

Mechanical filter respirators do not offer protection against gases or vapors adsorbed on unstable particles because the particle may release the gas of vapor. Mechanical filters should be changed at the end of a week's use or whenever an increase in breathing resistance is detected by the wearer, whichever is sooner. Filters may be replaceable or a permanent part of the respirator, such as the single-use disposable mask.

Limitations. The major limitations which apply to chemical cartridge respirators are:

- Oxygen Deficiency or Enrichment – They are not for use in atmospheres of less than 19.5 or more than 23.5% oxygen.
- Poor Warning Properties – They are not for use with exposures to gases and vapors which cannot clearly be detected by odor or taste (e.g carbon monoxide).
- Highly Toxic Substances – Cartridges do not protect against gases and vapors which are extremely toxic in very small concentrations (e.g. hydrogen cyanide).

Air-Line Respirators

This type of respirator supplies a higher level of breathing protection than air-purifying respirators. However, they shall be used only in atmospheres NOT IDLH unless equipped with an emergency escape bottle which will allow its use in an IDLH environment. It is not anticipated that air-line respirators will be used on this project.

How They Work. A suitable air supply source, such as an ambient air pump, a compressor or a compressed breathing air cylinder, supplies clean air via a hose to the facepiece. It can deliver air to the user in sufficient volume to meet most wearer's breathing demands. Air flow requirements are 4 cfm for tight fitting facepieces and 6 cfm for loose fitting hoods and helmets and must be met by supplying the pressure and volume of air at the hose connection as specified by the respirator manufacturer.

Self-Contained Breathing Apparatus (SCBA)

This type of respirator provides the highest level of respiratory protection in toxic, oxygen-deficient, oxygen-enriched or flammable environments. The wearer is independent of the surrounding atmosphere because he/she is breathing with a system admitting virtually no outside air. The air supply of the cylinder supports breathing requirements for up to 30 minutes depending on a person's size, condition and activity. An alarm warns when air supply is low.

How They Work. The pressure demand SCBA uses compressed air up to 2,215 psi, which is contained in a cylinder worn by the user and supplied through pressure-reducing valves to the facepiece. The air is supplied continuously when the wearer inhales, thus meeting the wearer's breathing requirements. Pressure demand units have a slight positive pressure in the facepiece at all times. This prevents any inward leakage of contamination.

7.2.2 Training, Fit Testing and Recordkeeping

Selecting the respirator appropriate to a given hazard is important, but equally important is using a respirator that fits the individual wearer and using the selected device properly. Records of medical certification, training and fit test will be kept in the employee H&S records.

Training

Proper use of respirators is ensured by annual training of employees in selection, use and maintenance of respirators. Training will be provided before an employee is required to wear a respirator. Training will address employee knowledge of respirators, and ensure that the following information is provided:

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- What the limitations and capabilities of the respirator are;
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
- How to inspect, put on and remove, use and check the seals (fit checks) of the respirator;
- What the procedures are for maintenance and storage of the respirator;
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
- The general requirements of this Respirator Program and the OSHA standard.

In addition to annual hands-on training and fit-testing of respirators, additional re-training of employees will also be performed when:

- Changes in the workplace or the type of respirator used indicate the need for more training;
- Conditions indicate inadequate employee knowledge or skill regarding respirator usage; or
- Any other situation indicates that retraining is necessary to ensure safe respirator use.

Fit Testing

In order to obtain adequate protection from breathing hazards, there should be a proper match between the respirator and the wearer. Respirator users shall be fit tested using an OSHA-approved method during training before initial use if a different respirator is used, and annually thereafter.

The seal of the respirator shall be tested annually at a minimum, in conjunction with respirator training. Employees shall be fit tested with each type of respirator for which they may have a possible use during the coming year. The 29 CFR 1910.134 Appendix A, qualitative fit test procedures shall be used for testing the fit of half-face and full-facepiece respirators. Employees will be instructed on how to fit check the respirator each time before wearing.

To ensure proper protection once the wearer is fitted with a respirator, the facepiece seal of the respirator shall be checked prior to each use. This is done with the next two simple checks.

Positive Pressure Fit Check. Cover the exhalation valve cover with the palm of the hand and gently exhale into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward air leakage around the facepiece-to-face seal.

Negative Pressure Fit Check. Cover the inlet openings of the filters or cartridges with the palms of the hands or squeeze the breathing tube if present; inhale gently so that the facepiece collapses and hold your breath for ten seconds. If the facepiece remains in its collapsed position and no inward air leakage is detected around the facepiece-to-face seal, then the fit of the respirator is considered satisfactory.

7.2.3 Inspection and Maintenance

Proper inspection and maintenance of respiratory protective equipment is mandatory to ensure a continued good facepiece seal and protection from contaminants. Respirators that fail inspection or are found defective, shall be removed from service, discarded and replaced.

Equipment must be inspected by the user before each use. For equipment used only in emergencies, the period between inspections can be individually established, but it shall be done at least monthly. Escape only equipment must be inspected before being carried into the workplace. A record shall be kept of all inspections.

Air-Purifying Respirator. The inspection shall include checking the half-mask or full-face for the presence, deterioration, stiffening, cracks, cuts or distortion. Examine each part of the respirator for defects, and discard the respirator if defects are found (unless the defects can be eliminated by replacement of defective parts with new parts). Be sure that each of the following parts are inspected:

- Facepiece
- Inhalation and exhalation valves, seats and covers;
- Cartridge holder and gaskets;
- Cartridges, filters and canisters;
- Straps, buckles and head harness; and
- View window in full facepiece.

Maintenance includes properly cleaning, disinfecting, repairing and storing respirators as well as replacement of disposable elements such as filters and cartridges. Each employee assigned a respirator is responsible for its inspection, care, maintenance, and storage. When repair or replacement is required, it shall be done only with manufacturer's parts, and by the manufacturer's instructions. Tests for the proper operation of regulators and valves on compressed air cylinders and checks for leaks in the system shall be done by the manufacturers' instructions. Repairs on the regulators shall only be performed by manufacturer-trained personnel.

Respirators shall be regularly cleaned and disinfected using the procedures of the OSHA standard or an equally effective manufacturer procedure. Those respirators (such as emergency equipment) that may be used by more than one person shall be cleaned and sanitized after each use. Respiratory equipment assigned to one individual shall be cleaned and disinfected periodically. Employees should wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use. Respirators shall be cleaned daily or as needed, when less frequently used.

7.2.4 Medical Evaluations

Persons to be assigned to tasks where respirators are used must first receive a medical evaluation, determining if they are physically able to perform the work while using respiratory protection. The medical status of persons assigned to use respirators will also be reviewed annually. The content of the exam will comply with the requirements of 29 CFR 1910.134(e) and Medical Evaluation Questionnaire. The following health and physical conditions are pertinent:

- Type and weight of respirator in use;
- The expected physical work effort;
- Additional protective clothing and equipment to be worn;
- Temperature and humidity extremes that may be encountered;
- Lung function;
- Medical history; and
- Health status and pre-existing conditions which might adversely affect the employee's ability to safely use a respirator.

Reassessment of the employee's medical condition and physical capacity to wear a respirator must be completed annually.

SECTION 8.0

HAZARD COMMUNICATION

The purpose of the Hazard Communication Program is to ensure that the hazards of chemicals located on-Site are evaluated and that information concerning physical and health hazards is transmitted to potentially exposed workers. These hazards shall be communicated to the worker by the use of container labeling, material safety data sheets, and employee training.

8.1 List of chemicals

Lists of chemicals used, or expected to be used, at the Site shall be maintained by each contractor or sub-contractor. Since this is not an operating facility with no chemicals manufactured or used in permanent processes, the list of chemicals is likely to change frequently and will be updated and maintained by each contractor as necessary. All contractors shall designate a file or location for the maintenance of this list of chemicals actively used at the Site.

8.2 Material Safety Data Sheets

Material Safety Data Sheets ("MSDS") are the primary method for identifying and communicating the hazards of chemicals used at the Site. They provide the necessary information for training, hazard evaluation, proper handling, emergency procedures, and employee personal protective equipment.

The following sections are typically provided in an MSDS:

Product Identification. The name, address and telephone number of the company that produced the material is listed in this first section; also the date the MSDS was issued and the name of the material. The law requires the name of the material on the MSDS to appear exactly the same, including spelling, as on the container.

Composition. This section contains information concerning the product's individual hazardous chemicals and their relative percentages.

Hazards Identification. This section gives information on the potential adverse health effects and symptoms associated with exposure to this material. If it has been determined that the material is a carcinogen, teratogen, mutagen, or toxic to aquatic life or danger to the environment, then this information may be found in this section. The section should also include the material's exposure limits, if they are known.

First-Aid Measures. If accidental exposure were to occur, then this section is valuable to determine the immediate first aid response. This section should indicate the proper first aid treatment for accidental exposure by inhalation, skin, eye, and ingestion. Almost in every MSDS the first statement says, 'Call a Physician'.

Fire Fighting Measures. This section of the MSDS describes the basic fire-fighting measures. This should include the fire and explosive properties of the material and the proper extinguishing materials. The precautions and safety procedures to effectively put out the fire are described here.

Accidental Release Measures. When a hazardous material is accidentally spilled, the emergency can be minimized if the proper response is made immediately. This section describes evacuation procedures, containment and cleanup techniques, and other emergency requirements. Information from this section will allow you to plan for emergency response, training of individuals using the hazardous material, and making available the necessary equipment to quickly contain and clean up a spill or leak.

Handling and Storage. This section provides safe storage and handling information for employees. General handling precautions and practices are described to prevent release into the environment and overexposure during contact with the material.

Exposure Controls/Personal Protection. The intent of this section is to reduce exposure of the worker to the product. Exposure controls include engineering controls like fume hoods and ventilation. Exposure controls also include administrative controls such as training, labeling and warning devices. This sections also provides the important information about PPE.

Physical and Chemical Properties. This section of the MSDS should provide the necessary information to identify a substance. The physical data is commonly provided, but varies depending on whether the substance is a gas, liquid, or solid at room temperature.

Stability and Reactivity. The information in this section should list materials or conditions that are hazardous when combined with the product, and should include: stability at room temperatures and atmospheric pressure, conditions to avoid, incompatible materials, decomposition products, and hazardous polymerization.

Toxicological Information. Information concerning the hazardous chemical's toxicity is listed in this section. However, this information can be listed in other sections of the MSDS like the Health Hazard and First Aid section. This information reflects animal testing, and human data. This toxicity data is mainly intended for medical professionals, occupational health and safety professionals, and toxicologist.

Disposal Considerations. The person using a chemical product should be aware of disposal aspects of the chemical so they do not inadvertently dispose of the waste in an improper manner.

Transportation Information. The shipping of hazardous materials is regulated by the Department of Transportation (DOT). This section provides the important DOT shipping name, ID (UN or NA numbers), hazard class, and labels required to be on the container.

Regulatory Information. This section provides regulatory information such as reportable quantities for spills. International, state, and local regulations may also be found in this section.

All contractors and sub-contractors are responsible for requesting and maintaining MSDSs for all chemicals they bring to and use at the Site. BC shall maintain files in the Weed Heights office that are available and accessible to employees during field activities. These files should be reviewed periodically, at least annually, to ensure they are complete.

MSDSs should be from the original product manufacturer, where possible, or generic MSDSs or International Chemical Safety Cards may be used if there is no manufacturer, as in the case of metals, or the manufacturer is unknown.

8.3 Labeling

All containers of hazardous substances must be adequately labeled to allow the employees to identify the contents and hazards of the chemicals within. Chemicals that are transferred from their original containers into secondary containers must also be labeled unless the secondary container is used by only one employee and the contents are transferred back to the original labeled container by the end of the work shift.

Minimum content of information contained on a primary or secondary container label includes:

- Identity of the chemical, including concentration;
- Appropriate hazard warnings; and
- Name and address of the chemical manufacturer.

Users should ensure that labels remain legible throughout the life of the product and should remark or relabel containers when the information is becoming difficult to read. At no time should anyone intentionally remove a label unless it is confirmed that the contents have changed, at which point the label should be updated to reflect the current contents. It is also important to ensure that any pipelines, tanks, or cylinders are accurately labeled.

8.4 Training

All Site workers should be trained on how to find the hazard information for chemicals they will be handling, including:

- How to find and read the information contained on an MSDS;
- Where project MSDSs are stored;
- The requirements for labeling all containers, including secondary containers;
- Operations in the work area where hazardous chemicals are present; and
- The basic requirements of the OSHA Hazard Communication Standard.

Employees should also receive training on the physical and health hazards of the chemicals they work with and measures they can take to protect themselves from these hazards. Employees should also be made aware of methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring, visual appearance or odor of hazardous chemicals when being released, etc.).

SECTION 9.0
SITE CONTROL MEASURES

9.1 Site Access and Security

Access to the Site will be limited to authorized federal, state, and local regulatory personnel, authorized ARC employees, authorized BC workers, sub-contractors, and authorized visitors. There are sufficient placards and signs providing warning or cautioning language that restricts entry to authorized personnel. Only visitors who have received prior authorization from appropriate ARC, BC, EPA, NDEP, or BLM supervisory personnel will be permitted entry to the Site. All authorized visitors will be advised of the potential hazards at the work Site during a pre-entry briefing.

The field team will be responsible for coordinating access and security to those areas of the Site where activities are being conducted. All individuals will be required to sign in and sign out when entering and leaving the Site; Site workers will be required to acknowledge that they are 'fit for duty' (i.e. uninjured and healthy for the work task they will be assigned) at both the beginning of the day and the end of the day. A sign-in register will be available in the Mine Office located in Weed Heights. The field team will ensure that appropriate warning signs or temporary fencing will be posted at work area entrances to delimit those areas that are 'off limits' to unauthorized personnel, and to indicate potentially hazardous conditions or required precautions (e.g., excavations, hard hat area, eye protection required, no smoking).

Personnel from BC have control over access and safety issues at those areas where work is being conducted that could pose a safety risk to visitors. Visitors may be admitted into work areas provided they: 1) are on official business; 2) have received Site-specific training or orientation by BC; 3) have met all the Site-specific training requirements for the area they have a demonstrated need to access (including PPE training); and 4) wear all required PPE. Visitors who do not meet the above criteria will not be permitted into work areas.

9.2 Restricted Work Zones

Restricted work zones may be established if work activities will be happening in areas of identified or suspected contamination to minimize employee exposure to the contaminants and to minimize the spread of those contaminants to other areas of the Site. Contamination and exposure hazards will be evaluated when establishing the initial work zone size, configuration, and location. Common barriers may be used to delineate work zones, in accordance with OSHA requirements (29 CFR 1910.120). These zones may change in size and location as project tasks evolve, based on project monitoring data, and as wind direction changes. Additionally, entrance and egress points may change based on these same factors. Work zones may include:

- Exclusion Zone ("EZ");
- Contamination Reduction Zone ("CRZ"); and
- Support Zone ("SZ")

Exclusion Zone. The exclusion zone will be large enough to encompass the primary task area for sampling or remediation and to allow equipment and personnel to move about freely and conduct necessary tasks. The minimum number of personnel required to safely perform project tasks will be allowed into the EZ. If the EZ will be relocated to another Site or reconfigured, it will be delineated in a configuration large enough to prevent non-field team personnel in the support zone from being exposed to potential safety and health hazards. The EZ shape and size will be based on the tasks being conducted, existing structures and facilities, and potential for impact to adjacent areas from project tasks or contaminants.

The EZ is a controlled access zone at all times. The EZ will be controlled physically by barricades, signs, or caution tape and access will only be allowed under permission of the SSO or field manager. An entry and exit point will be established at the periphery of the EZ connecting to the contamination reduction zone to regulate the flow of personnel and equipment and control the spread of contamination.

The boundary may be expanded or contracted as these factors change or additional monitoring information becomes available. All personnel who enter the EZ will wear the appropriate level of PPE for the hazards present and have required training as listed in previous sections of this HASP.

Contamination Reduction Zone. The contamination reduction zone is the transition area located between the exclusion zone and support zone. The CRZ may not be formally delineated, but will be designated by the travel path from the established entry and exit point. The CRZ will serve to buffer the support zone from potentially contaminated areas. The CRZ may serve as a staging area for equipment and temporary rest area for personnel.

Support Zone. The support zone will be considered a 'clean' area. The location of the SZ will be in a prevailing upwind direction from the EZ (where possible) and readily accessible from the nearest road. The SZ is a designated area outside the CRZ and does not have to be delineated. Support trailer, vehicle parking, additional emergency equipment, extra PPE, and stored monitoring and sampling equipment may be located in the SZ. Visitors who do not have appropriate training to enter other project areas will be restricted to this zone.

SECTION 10.0

DECONTAMINATION PROCEDURES

If activities result in conditions where there is direct contact with contaminated media or other hazardous substances, then the procedures discussed in the following paragraphs should be employed to ensure that both personnel and equipment leaving the Site are free of contamination. The field team, in consultation with the Field Manager or Site Safety Officer, can modify procedures, as necessary, thereby adapting them to existing work Site conditions (e.g., changes in the nature and extent of contamination, PPE level, work tasks, etc.).

10.1 Personnel and Equipment Decontamination

All disposable PPE and other equipment will be discarded and properly disposed of in plastic trash bags. Any reusable PPE will be thoroughly decontaminated. Boots encrusted or heavily soiled with potentially contaminated sludge, dirt or other substances will be cleaned using a stiff brush and water. Hard hats and safety glasses will be cleaned with a damp cloth or paper towel and rinsed with clean water as needed.

If personal decontamination becomes necessary due to contact with irritating, corrosive, or hazardous materials, the safety shower and eye wash station is located in the Lab Building on the south side of Burch Drive by the Arimetco plant. An additional personnel decontamination station closer to work activities may be established on Site as needed.

Reusable sampling equipment will be decontaminated by washing, or a series of washings, using a detergent-water solution (Alconox or Liquinox) followed by a series of rinsings using generous amounts of water. Wash and rinse solutions will be contained and handled as operation-derived waste. Detailed equipment decontamination procedures are provided in SOP-05 'Equipment Decontamination'.

Heavy equipment, such as drill rigs, backhoes, other earth-moving equipment or field vehicles, requiring decontamination will be washed in the EW Building or at a designated equipment decontamination area on Site, closer to work activities.

Radiological Areas. Personnel and equipment that have entered a radiological control area, or contacted any of the removed waste, will be monitored for surface radiological contamination prior to leaving the area using a survey meter with a probe suitable for measuring alpha/beta contamination. If surfaces show removable contamination activity levels above applicable limits, they will be cleaned until the prescribed level is met. All disposable PPE worn in the RCA must be removed upon exit, disposed of in plastic bags and stored in labeled 55-gallon drums to be evaluated and disposed of as investigation derived waste. Non-disposable PPE will be frisked and must meet the same release requirements as those defined above.

10.2 Disposition of Operation-Derived Wastes

All disposable PPE, equipment, plastic sheeting and other items that may have been in contact with contaminated materials will be placed in plastic trash bags for disposal. Other solid wastes that have not had contact with contaminated materials, such as packaging materials or domestic waste, will be disposed of in accordance with local domestic waste disposal requirements.

Liquid non-hazardous wastes, such as decon wash/rinse solutions and well purge water, will be stored in drums or tanks and transported to one of the fully lined process solution ponds in operation at the Site for final disposal.

Substances that are suspected of being hazardous due to contact with known hazardous waste will be segregated and stored in labeled containers, sampled and submitted for analysis to ensure proper disposal.

Radiological Areas. An area for storage and disposal of radiation contaminated material will be designated prior to the start of Site work. Solid waste will be collected at the end of each day in an appropriate container and stored in the designated disposal area. Material will be double bagged, placed in 55 gal drums, and stored until a final determination of the disposal methods for the materials has been made. Liquids (such as rinsate, and decontamination fluid) will be collected in drums in the various work locations. All waste will be classified and disposed of in accordance with federal regulations.

SECTION 11.0
EMERGENCY RESPONSE PROCEDURES

This section describes contingencies and emergency response procedures to be implemented at the Site. The procedures are designed to provide the contractor and subcontractor personnel with the guidance necessary to handle most emergency situations.

11.1 Emergency Assistance

In the event of an emergency, call 911 for emergency assistance immediately. Be aware that calls made from a cell phone may not be routed to the local dispatcher. It is recommended that emergency calls be placed from a 'land line' or that the Lyon County Sheriff dispatcher be called directly (see Table A1 at the front of this HASP). The Lyon County Sheriff will identify and contact the appropriate responders based upon the nature and severity of the emergency situation. ARC and BC management should also be notified as quickly as possible, at least within one hour of the incident. When reporting an emergency incident, be prepared to provide the following information to the emergency dispatcher:

- Nature of the emergency (e.g., fire or spill);
- Location of emergency;
- Access to the Site (location of gate, escort will show them to the incident location);
- Size and extent of emergency;
- Materials involved; and
- Injury to personnel.

Table A2 is a comprehensive list of additional notification or information phone numbers and Figure A1, at the beginning of this HASP, show the route and written directions to the South Lyon Medical Center. The on-Site Field Manager and/or Site Safety Officer has final authority for first response to on-Site emergency situations. Upon arrival of the appropriate emergency response personnel, the Site emergency coordinator shall defer authority to the responding agency but shall remain on the scene as necessary to provide any possible assistance.

11.2 Site Communication

The primary means of communication for emergency situations will be cell phones or the Site two-way radio/push-to-talk ("PTT") phone maintained by BC. A Site PTT phone, with Site emergency contact numbers pre-programmed, should be issued to Site workers and contractors. Personnel are required to carry them on their person and have phones turned on at all times in order to receive or make emergency contacts.

If hand-held two-way radios are available at the Site, they should be used to facilitate safe and efficient operations when individuals are working apart and out of sight or sound from each other. In some instances, these radios can be used in lieu of the buddy system when individuals are working alone and out of sight. Radio capability should be verified frequently by establishing mutual contact.

11.3 Emergency Evacuation

In the event of an emergency that requires evacuation of the Site, the following alarm procedures shall be followed:

- Make verbal contact with all Site workers using the phone or two-way radio system;
- All personnel shall immediately proceed to their vehicle and leave the Site; and
- All personnel without vehicles shall immediately proceed to the vehicle they arrived in and meet with the driver of the vehicle.

11.4 Incident Notification and Reporting Requirements

In the event of an injury-accident, hazardous substance release, or emergency situation (existing or imminent), the field team must notify the BC PM or PSM as soon as possible using the project call-out list in Table A1. The PM or PSM is then responsible for making notification to the ARC Project Manager. Verbal notification and reporting requirements vary based on the severity of the incident and should be completed in accordance with ARC's 'Incident and Near Miss Notification and Reporting Guidance Manual'.

Circumstances of the occurrence and preventative measures will be discussed with all personnel prior to resuming regular activities. The SSO will investigate causes and recommend appropriate control measures. The Project Manager is responsible for reviewing the information and determining if further investigation or corrective measures are required.

ARC Notification & Reporting Procedures. Incidents are classified into the following basic types:

- Major/High Potential
  - Any injuries or illnesses resulting in fatalities or multiple serious injuries
  - Fire, explosion or other property damage >$500,000
  - Material spill >100 barrels or >Reportable Quantity
- Non-Major Incident
  - Any injuries or illnesses resulting in days away from work ("DAFW"), OSHA recordable, or first aid
  - Fire, explosion or other property damage $500 to $500,000
  - Any spill <100 barrels

- Near Miss/Unsafe Condition
  - Any potential for injury or illness
  - Any risk of fire, explosion or other property damage
  - Any potential for spill or release

Key Points

- Whenever a Major Incident or High Potential Incident occurs, the BC PM and PSM must receive immediate verbal notification, followed by a written report.
- The BC PM or PSM shall make verbal and notification to the ARC PM within one hour of the incident, followed by a written report.
- All incidents should be documented using the **Traction System**. Traction is a web based system used to track incidents, advanced safety audits, hazops, and audits.
- The **BP Incident Notification Center (1-800-321-8642 or 312-856-2200**) is a resource for communications as well as emergency response. If needed, the Incident Notification Center can be called for notification support on Major Incidents when ARC personnel are not immediately available and when an incident has occurred where the severity is unknown or additional support may be needed.

11.5 Exposure/Injury Medical Surveillance

Any employee who suffers an illness, injury, or chemical exposure is required to see or consult with a physician. Depending upon the extent and type of exposure, illness, or injury, it is critical to perform follow-up testing within 24 to 48 hours. The contractor will ensure that appropriate medical follow-up testing is conducted, where appropriate. The physician responsible for conducting the employee's medical surveillance examinations shall be notified and consulted to determine the type(s) of tests required to accurately monitor the employee. A worker may return to work only with the written approval of the attending physician.

11.6 Recordkeeping

In addition to OSHA record keeping requirements, the Project Manager will maintain a project file of any H&S-related activities (monitoring, sampling) and incidents occurring at the Site. Any exposures or potential exposures are to be recorded, as well as accidents or incidents that require the filing of a report (e.g., injuries, illnesses, accidental damage to property, or 'near mis' occurrences that could have resulted in personal injury).

SECTION 12.0
ASBESTOS HANDLING

The purpose of this section is to provide information regarding the hazards associated with asbestos and asbestos containing materials ("ACM") and issues to be addressed during projects involving potential exposure to airborne concentrations of asbestos. Asbestos related work activities, including inspection, testing and handling, shall be done in compliance with EPA regulations (40 CFR Part 763). Affected Site workers shall be made aware of the hazards, safe work practices, and regulatory requirements associated with asbestos. For detailed asbestos HSSE procedures refer to the BC H&S Program Section 150 Asbestos.

12.1 Training and Medical Surveillance

BC employees who work on projects where they may be exposed to asbestos must complete initial asbestos awareness training. The training provides general information regarding asbestos hazards and control measures.

Subcontractors are responsible for complying with H&S training requirements relating to asbestos exposure and for providing the training necessary to complete their tasks safely and in accordance with regulatory requirements.

Persons performing asbestos-related activities will receive training and certification appropriate for their activities as required by regulatory statute. For example, persons performing building inspection will have AHERA Building Inspector, persons preparing abatement specifications will receive AHERA Project Designer, abatement workers will have received AHERA Contractor, and abatement foremen will have completed AHERA Contractor/Supervisor.

A medical surveillance program is required for employees who, for a combined total of 30 days or more per year, are engaged in Class I, II, or III work or are exposed at or above a permissible exposure limit. The medical surveillance program consists of a medical and work history, a standardized questionnaire, and a medical examination and consultation. Subcontractors must ensure their employees receive medical surveillance as required.

12.2 Competent Person Requirements

The competent person must be trained in the inspection of regulated work areas and equipment and in the determination of safe working conditions. Generally, the competent person will be the foreman/supervisor for the asbestos contracto. The asbestos competent person must:

- Have a working knowledge of OSHA and EPA asbestos standards.
- Be capable of identifying asbestos hazards.

- Have the authority to take prompt corrective measures to eliminate hazards.
- Oversee the setup of regulated areas, enclosures, or other containment.
- Ensure, by inspection, the integrity of enclosures or containment.
- Set up procedures to control entry to and exit from enclosures and regulated areas.
- Supervise employee exposure monitoring.
- Verify that employees wear respirators and protective clothing when working within enclosures or using glove bags.
- Verify that employees set up, use, and remove engineering controls and use work practices and personal protective equipment ("PPE") in compliance with requirements.
- Verify that employees use hygiene facilities and observe decontamination procedures.
- Verify that engineering controls function properly and employees use proper work practices.
- Verify that notifications are made with respect to communication of hazards.

For Class I and II asbestos work, the competent person must complete the training which meets the criteria of EPA's Model Accreditation Plan (40 CFR Part 763), or equivalent. For Class III and IV asbestos work, the competent person must complete training consistent with EPA requirements for training of local education agency maintenance and custodial staff as specified in 40 CFR 763.92(a)(2).

12.3 Safe Work Practices

Site workers who may be exposed to airborne concentrations of asbestos above the regulatory limits must follow the requirements listed below.

- Buildings or structures built before 1980 must be inspected for ACM before starting activities where the potential exists to generate airborne concentrations of asbestos. Inspections must be performed by licensed Asbestos Hazard Emergency Response Act ("AHERA") building inspectors.
- Thermal system insulation and surfacing material found in buildings constructed before 1980 and asphalt and vinyl flooring material installed not later than 1980 must be designated as potential asbestos containing material ("PACM") and treated as such until testing indicates otherwise.
- Personnel must not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met. Regulated areas are areas where airborne concentrations of asbestos are above, or may be above, the permissible exposure limit ("PEL"), without regard to the use of respirators.
- Personnel must not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.

- Warning signs must be displayed at each regulated area and posted at approaches to regulated areas so that protective steps can be taken before entering regulated areas.
- Respiratory protection and other exposure controls selection must be based on the most relevant exposure monitoring results obtained from, or by the direction of, the asbestos competent person.

12.4 Exposure Limits

- The OSHA PEL for asbestos is 0.1 fiber per cubic centimeter (f/cc) of air as an 8-hour time weighted average ("TWA").
- The excursion limit, or short-term exposure limit ("STEL"), is 1.0 f/cc of air averaged over a sampling period of 30 minutes.
- The American Conference of Governmental Industrial Hygienists ("ACGIH") recommends an occupational exposure limit of 0.1 f/cc.

12.5 Exposure Assessment

Exposure monitoring must be performed to determine actual airborne exposures. An initial assessment must be conducted through the collection of one or more 8-hour TWA samples for full-shift exposure for employees within each work area. In addition, one or more 30-minute samples must be collected during operations expected to result in the highest exposures over the course of the day for comparison against the excursion limit.

Negative exposure assessments can be used when objective data indicate that the product or material being disturbed (or the one specific work activity) will not release fibers in concentrations greater than the PEL or the excursion limit under those work conditions having the greatest potential for releasing asbestos. Negative exposure assessments can also be used: 1) when historical monitoring data, collected within the previous 12 months of the current job or project, represent similar ACM and similar activities and controls; 2) when all other factors are similar (such as training, environmental conditions, and work practices); and 3) when a high degree of certainty exists that employee exposure will not exceed the PEL and the excursion limit.

- The exposure assessment must be completed before or at the beginning of fieldwork.
- The assessment must be used to determine the appropriate controls to reduce exposures below the PEL and the excursion limit.
- Class I work must be assumed to occur above the PEL and the excursion limit until monitoring data indicate otherwise.
- During Class I and II work, daily air monitoring must be conducted that represents each employee's work. Air samples must be collected for comparison against both the PEL and the excursion limit.

- Daily monitoring is not required when work occurs with supplied air respiratory protection.
- For Class III and IV work, air samples representing PEL and the excursion limit must be collected periodically.
- When exposure monitoring results statistically indicate exposures below the PEL and the excursion limit, air monitoring may be suspended.
- Additional monitoring may be required when there is a change in work practices, personnel, or controls.

12.6 Communication of Hazards

Information concerning asbestos hazards must be communicated according to the requirements of the OSHA Hazard Communications Standard, including the following requirements concerning warning signs and labels, material safety data sheets ("MSDS"), and employee information and training:

- Work on buildings built or renovated before 1980 must be inspected for ACM.
- When installing materials labeled as containing asbestos, contractors must notify owners of the presence and location of ACM.
- Labels must be affixed to all products containing asbestos and to all containers containing such products, including waste containers. Labels must be printed in large, bold letters on a contrasting background and must contain the following information: 'Danger—Contains Asbestos Fibers—Avoid Creating Dust—Cancer and Lung Disease Hazard'.
- At regulated areas where employees are exposed to asbestos above the PEL, warning signs must be posted as follows: 'Danger—Asbestos—Cancer and Lung Disease Hazard—Authorized Personnel Only'.
- Warning signs must be posted at such a distance from regulated areas that an employee may read the signs and take protective steps before entering the area.
- Owners, contractors, and other personnel working within or adjacent to the area must be notified of ACM work.
- Notification must be made to prospective employers applying or bidding for work whose employees may work in or adjacent to areas with ACM or PACM.

12.7 Control Methods

All operations, regardless of the level of exposure:

- Use only HEPA-filtered vacuums to collect debris and dust that might have ACM and PACM.

- Use wet methods or wetting agents to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where it can be demonstrated that wet methods would create other hazards (e.g., electrical hazards).
- Package asbestos wastes and debris in leak-proof containers. The generally recommended containers are 6-mil plastic bags, sealed leak-tight. Package asbestos waste slurries in leak tight drums if they are too heavy for plastic bags. All bags and containers must be preprinted or tagged with a warning label.
- Prohibit employees from smoking or eating in work areas where they may be exposed to asbestos.

In addition to the above control methods, the following methods must be used to comply with the TWA PEL and excursion limits:

- Ensure that local exhaust ventilation is equipped with HEPA filtration.
- Enclose or isolate processes producing asbestos dust.
- Ventilate the regulated area to move contaminated air away from the breathing zone of employees and toward a HEPA filtration or collection device.
- Use other engineering and work practice controls that can be shown to be feasible.
- Whenever the engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PEL or excursion limit, supplement these controls with respiratory protection.
- High-speed abrasive disc saws not equipped with a point of cut ventilator or enclosures with HEPA-filtered exhaust air are not permitted.
- Do not use compressed air to remove asbestos, or ACM, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- Do not dry sweep, shovel, or use other dry cleanup of dust and debris containing ACM and PACM.
- Do not rotate employees to reduce employee exposure to asbestos.

12.8 Personal Protective Equipment

The following PPE requirements are in addition to Site minimum PPE requirements.

Respiratory Protection

- Respiratory protection must be used during periods when employee exposure to asbestos exceeds the PEL, when work operations for which engineering and work practice controls do not reduce employee exposure to or below the PEL, when an employee requests a respirator, and when respirators are required to provide interim protection during initial exposure assessments.

- A respiratory protection program must be implemented in accordance with OSHA requirements and BC HSP-143, Respiratory Protection. Subcontractor respiratory protection programs must meet or exceed these requirements.
- Respirators are required during Class I activities, Class II activities when ACM is not removed in an intact state, Class II and III activities when wet methods are not used or a negative exposure assessment has not been conducted, Class III activities when ACM or PACM is disturbed, and Class IV activities in regulated areas where respirators are required.
- All other work activities where employees are exposed above the PEL or the excursion limit requires the use of respiratory protection.
- Powered air-purifying respirators ("PAPR") must be provided to employees who request them and where they will provide adequate protection.
- Respirators must be provided at no cost to the employee in accordance with Table 12-1.

Table 12-1. Respiratory Protection From Asbestos Fibers

Airborne Concentration of Asbestos Fibers	Required Respirators [a]
Not in excess of 1 f/cc	Half-mask air-purifying respirator with HEPA filters
Not in excess of 5 f/cc	Full facepiece air-purifying respirator with HEPA filters
Not in excess of 10 f/cc	Powered air-purifying respirator with HEPA filters or supplied-air respirator operated in continuous flow mode
Not in excess of 100 f/cc	Full facepiece supplied-air respirator operated in demand mode
Greater than 100 f/cc; unknown concentrations	Full facepiece supplied-air respirator operated in pressure demand or other positive-pressure

[a] Respirators specified for higher concentrations can be used at lower concentrations of asbestos.

Protective Clothing

- Employees must be provided, at no cost, protective work clothing and equipment including coveralls or similar full-body clothing, gloves, head coverings, and foot coverings when exposures exceed the PEL or excursion limit.
- The competent person must inspect work clothing at least once per work shift for rips or tears. Damage must be repaired immediately, or the work clothing must be immediately replaced.
- All clothing requiring laundering must be packaged in sealed containers. Containers must be labeled as follows: 'Danger—Asbestos—Cancer and Lung Disease Hazard—Authorized Personnel Only'. Do not remove fibers by blowing or shaking.
- Employees must not leave the workplace wearing protective clothing or equipment that is worn during the work shift.
- Any person who cleans or launders protective clothing or equipment must be informed in writing of the potentially harmful effects of exposure to asbestos.

12.9 Decontamination

- A decontamination area must be established adjacent to Class I work involving more than 25 linear feet or 10 square feet of ACM or PACM.
- The decontamination area should consist of an equipment room, shower area, and clean change area.
- Contaminated protective equipment must be disposed of in the equipment area.
- All non-disposable work clothing must be HEPA-vacuumed prior to removal in the equipment area.
- The clean change area must be equipped with lockers or storage containers for each employee's use.
- Decontamination area entry and exit procedures must be established that minimize or eliminate cross-contamination of street clothing and adjacent areas.
- If food and beverages are consumed at the work Site where employees perform Class I work, lunch areas must be provided in which the airborne concentrations of asbestos are below the PEL and the excursion limit.
- Employees performing Class IV work in regulated areas must comply with the hygiene practices established for that area.
- The decontamination requirements for Class I work involving less than 25 linear feet or 10 square feet, and for Class II and Class III activities where exposures exceed the PEL or the excursion limit, include an equipment area adjacent to the regulated area for the decontamination of employees and their equipment.
- Equipment areas must consist of an area covered with an impermeable drop cloth on the floor or horizontal working surface.
- Equipment areas must be large enough to clean equipment and remove PPE without spreading contamination beyond the area.

SECTION 13.0
REFERENCES

29 CFR Part 1910, *Occupational Safety and Health Standards for General Industry*. OSHA.

29 CFR Part 1926, *Safety and Health Regulations for Construction.* OSHA.

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